CleanHarbors®
ENVIRONMENTAL SERVICES, INC.

FORMER CWMCS
CHICAGO INCINERATOR FACILITY

CHICAGO, ILLINOIS

INITIAL CORRECTIVE MEASURES PROGRAM REPORT

DECEMBER 4, 1995

CLEAN HARBORS OF CHICAGO, INC.
(FORMER CWMCS CHICAGO INCINERATOR FACILITY)
INITIAL CORRECTIVE MEASURES PROGRAM
FINAL REPORT

DECEMBER 4, 1995

DAMES & MOORE

Dames & Moore Project No. 25713-012

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1.0 INTRODUCTION

1.1 Site Description

The former Chicago Incinerator facility is located at 11700 South Stony Island Avenue in Cook County, Chicago, Illinois. The site is located on the east shore of Lake Calumet, in Section 24, Township 37 North, Range 14 East, between 41° 41'11" and 41° 41'23" west longitude and 87° 34'33'' and 87° 35'8" north latitude. The property is owned by the Illinois International Port District, and has been leased to several corporations since the 1970s which have treated, stored and disposed of hazardous wastes on the property. Previous operators have included Chemical Waste Management Chemical Services, Inc. The facility is currently being operated by Clean Harbors of Chicago, Inc. (Clean Harbors).

As shown in Figure 1-1, the property is one pier in a series of man made piers and slips constructed on the east side of Lake Calumet. The pier is approximately 400 feet wide from the eastern property boundary, and extends approximately 1,800 feet west into Lake Calumet. The piers are separated by slips approximately 350 feet wide and 1,200 to 1,400 feet long. Clean Harbors also operates a facility that treats, stores, and disposes of hazardous waste on the pier to the south. The pier to the north is undeveloped, and the Paxton Avenue landfill is located east of Stony Island Avenue.

Access to the site is via interstate 94 (I-94) which runs north-south along the west shore of Lake Calumet. From I-94, the facility can be reached by way of 130th Street east to Torrance Avenue, Torrance Avenue north to 122nd Street, west on 122nd Street to South Stony Island Avenue, and north on South Stony Island Avenue to the facility.

1.2 Background

This site is located on the east shore of Lake Calumet within an industrial region of Chicago. Lake Calumet extended beyond its present shoreline until the 1920's. The construction of the Cal-Sag Channel and associated flood control units allowed for the drainage of many wetland areas in the vicinity of Lake Calumet. Other wetland areas were filled with miscellaneous materials including construction debris, slag, and wood. Most of the present day Chicago Incinerator Facility remained under water until the early 1960's when the railroad was constructed along the east shore of the lake on fill material. This railway right-of-way is currently located along the eastern property boundary. The pier was constructed by filling in Lake Calumet in the 1960's and early 1970's. Filling began along the east shoreline along the railroad right-of-way and progressed west into Lake Calumet.

In 1971 Hyon Waste Management, Inc. constructed an office, an incinerator, and a control building on the property owned by the Chicago Port Authority (currently know as the Illinois International Port District). Additionally, Hyon constructed a series of surface impoundments for the treatment, storage, and disposal of wastes. Documentation on the quantities of waste treated, stored, disposed at each SWMU has been sought, but is not available. Hyon records are restricted as a result of an ongoing lawsuit between the former operators of Hyon Waste Management and the City of Chicago.

Hyon operated the waste treatment facility until 1979. A description of waste treatment and disposal activities completed on the property is described in more detail in Section 2.2 of this report. In 1979, Hyon combined with Envirotherm Illinois, Inc. to continue waste disposal services. Envirotherm operated the facility for 200 days at which time the equipment and permits were purchased by SCA Chemical Services, Inc. in September 1980.

A site restoration plan prepared by James Douglas Andrews was submitted to the IEPA in February 1981 and subsequently completed in the fall of 1981 and summer of 1982. This plan included construction of a clay lined vault, removal of sludges from the Hyon SWMUs, and backfilling the former surface impoundments with clean fill. In addition, three interim surface water impoundments were constructed including two 500,000 gallon cooling water basins and one 1,000,000 gallon stormwater collection basin. In 1984, the stormwater basin was subdivided into two smaller basins.

CWMCS subsequently purchased the assets of SCA in 1985, and continued to operate the facility under RCRA Interim Status until 1991. At that time, commercial operations at the facility were suspended. CWMCS also closed the interim surface water impoundments constructed during the pier restoration project. All fluids and sludges were removed from the impoundments. The impoundments were subsequently backfilled with inert material and covered with a clay cap in 1993. Post closure groundwater compliance monitoring began in 1994.

Clean Harbors recently took over the site from CWMCS, and expanded operations from its existing facility south of the former CWMCS property into the incinerator process area. Clean Harbors has operated a permitted hazardous waste disposal and treatment facility on the parcel of property south of the former Chicago Incinerator Facility since 1989. Consequently, Clean Harbors RCRA Part B permit has been modified to include expanded operations on the newly added portion of the Clean Harbors facility (the former CWMCS facility).

1.3 Purpose

The purpose of this report is to present a description of the existing conditions at the former Chicago Incinerator Facility. Activities at this facility have included the storage, treatment, and disposal of hazardous waste by several waste disposal operators. Clean Harbors was issued a RCRA Part B Permit Modification by the IEPA on June 30, 1995. Clean Harbors must comply with specific requirements of this permit. This report has been prepared to satisfy Section V.D. of the RCRA Hazardous Waste Management Permit (ILD #000608471); preparation of an Initial

Corrective Measures Report. This Initial Corrective Measures Program Report presents an evaluation of data collected to date and a survey of potential corrective measures.

2.0 RFI RESULTS

2.1 Introduction

Dames & Moore, on behalf of CWMCS, completed an RCRA Facility Investigation (RFI) of the Chicago Incinerator Facility. The RFI was completed in accordance with RCRA Corrective Action Plan ILD 000672121. The Corrective Action Plan outlined seven (7) tasks for completion of the RFI as follow:

- I Description of Current Conditions;
- II RFI Work Plan Requirements;
- III Facility Investigation
- IV Evaluation of Corrective Measures Technologies
- V Investigation Analysis;
- VI Laboratory and Bench-Scale Studies; and
- VII Reports.

The RFI was completed in two phases of investigation. The scope of work for Phase I of the investigation completed in 1989 was performed in accordance with the April 1988 Work Plan approved by the USEPA in August 1989. The Phase I Work Plan included a description of previous investigations completed at the facility. (This description has been updated, and is presented in Appendix A of this report.) Phase II of the site investigation was completed in 1992 in accordance with the Phase II Work Plan approved by the USEPA in August 1991. This completed Tasks I, II and III of the Corrective Action Plan.

The data collected during both phases of investigation and presented in the Draft and Final RFI Reports was intended to support a Corrective Measures Study (Task IV), and Laboratory and Bench Scale Studies (Task VI), if needed. Additionally, an evaluation of Corrective Measures Technologies was included as Part 2 of the Final RFI Report. The RFI Final Report was submitted to the USEPA in February 1995. Submittal of the Final RFI Report completed Tasks IV and V in accordance with Task VII.

Data collected during Phase I and Phase II of the RFI were presented in a June 1992 Draft RFI Report in partial completion of Task V as described in Task VII. USEPA review comments for the Draft RFI Report were received by CWMCS on October 14, 1992. Responses to the comments were submitted to the USEPA on January 6, 1993, and discussed in a May 5, 1993 meeting.

At that time (March 1993), the USEPA issued final approval of an air sampling Quality Assurance Project Plan (QAPjP) submitted by CWMCS for four former SWMUs suspected of releasing volatile compounds to the air. Sampling began in May 1993, but was not completed until June 1994 because of adverse weather conditions during 1993. During this extended sampling period, a Final Draft RFI Report was prepared and submitted in November 1993 incorporating the USEPA comments on the original June 1992 draft. Additionally, separate draft Human Health and Ecological Risk Assessments were submitted in January and March 1994, respectively.

CWMCS received USEPA comments on the November 1993 Final Draft Report and Draft Risk Assessments on June 6, 1994. (This coincided with completion of the air sampling on June 4, 1994.) A meeting to discuss these comments was held on July 7, 1994. Subsequently, responses to the comments were submitted without finalization of the air emissions data on August 22, 1994.

On January 5, 1995, the USEPA responded to the August 1994 submittal. CWMCS subsequently prepared a Final RFI Report incorporating comments on the previous draft reports and risk assessments, along with the final air emissions data. This report was submitted in February 1995. This report also incorporated specific responses to the January 5, 1995 USEPA letter as Attachment 5 to Appendix R of the Final RFI Report. These responses have been included as Appendix B to this Initial Corrective Measures Program Report.

With the submittal of the Final RFI Report, CWMCS considered that the USEPA made an erroneous preliminary written determination as to the need for a Corrective Measures Study (CMS) at the facility. CWMCS submitted a letter to USEPA on March 27, 1995 attempting to address issues relevant to the Agency's determination, since no basis for the CMS determination was provided. The March 27, 1995 letter identified four issues that were unresolved. A description of the previous USEPA comments and CWMCS responses was restated in the March 27, 1995 submittal. The USEPA responded to this submittal in a letter dated May 3, 1995. Responses to USEPA comments presented in the May 3 letter are presented in Appendix C of this report.

2.2 Background

The Hyon operation was reported to include incineration of liquid and hazardous waste and the neutralization and biological treatment of aqueous wastes. Ten (10) SWMUs (including the Hyon Tank Farm) were identified in the RFI Work Plan. These SWMUs do not currently exist due to site restoration work completed in 1982. Specific information on former waste management practices is contained in Hyon records. However, access to Hyon records is restricted due to the ongoing lawsuit between former Hyon operations and the City of Chicago. It is assumed that a variety of wastes were handled at the facility at multiple locations. Since the former SWMUs were located adjacent to one another, the presence of similar constituents at each SWMU location was suspected. Consequently, the entire facility was investigated during both phases of the RFI. Sample collection was performed by matrix rather than by SWMUs. Matrices investigated included groundwater saturating the fill materials used to construct the pier, soil samples of both the fill and underlying clay, and sediment and surface water samples collected from Lake Calumet. Groundwater and clay samples collected during Phase I were analyzed for all compounds defined in 40 CFR, Part 264, Appendix IX. Fill soil, sediment and surface water samples were analyzed for priority pollutant compounds common to Appendix IX. During Phase II of the RFI, only clay soil samples were analyzed for the full Appendix IX compound list. Groundwater, fill soil, surface soil, sediment, and surface water samples were analyzed for metals, semivolatile and volatiles common to Appendix IX. Sampling locations are shown on Figure 2-1 and on Figure 2-2.

A description of each SWMU and the soil and groundwater samples collected by SWMU is presented in Sections 2.2.1 through 2.2.10. Table 2-1 lists sample locations by SWMU. A discussion regarding the samples collected from the clay layer beneath the SWMUs is presented in Section 2.2.11. A discussion regarding Lake Calumet sediment and surface water results is presented in Section 2.2.12.

2.2.1 SWMU #1 - Biochemical Filter Beds

The Biochemical Filter beds were constructed by Hyon in the early 1970s north of the Incinerator Facility as shown on Figure 2-2. The Biochemical Filter beds consisted of two impoundments, each containing 5 separate filter beds. Exact waste quantities treated within this SWMU are unknown due to restricted access to Hyon records. During the period between 1972 and 1976, approximately 68 million gallons of chemical waste were received at the facility. Approximately 10% of this material was incinerated, and the remainder was treated biochemically (ref. 7).

All liquids were removed from the SWMU, and sludges were excavated as part of the 1981-1982 pier restoration project. Sludges were temporarily stored on site and placed in a clay lined vault constructed at the location where the former SWMU #5 existed. The excavation was then backfilled to grade with inert fill material. Based upon 1975 aerial photographs and material excavated from the SWMU as part of the pier restoration, it is estimated that the SWMU held approximately 30,000 cubic yards of material (ref. 5).

During Phase I of the RFI, 17 soil borings were advanced at locations in the vicinity of the former SWMU. Six monitoring wells, including 2 upgradient wells, were installed with screens intersecting the saturated fill material used to construct the pier. During Phase II of the RFI, soil and groundwater samples were collected from an additional ten (10) soil borings (FG-1 through FG-10) advanced at locations within the former SWMU, and surface soil samples were collected from eight (8) sample locations. Sample locations are listed in Table 2-1, and shown on Figure 2-2. Soil sample results and groundwater sample results from both phases of investigation have been summarized in Tables 2-3 through 2-6.

As shown in Tables 2-3 and 2-4, volatile and semivolatile organic compounds and metals were detected in groundwater samples collected from wells within the former SWMU, and around the perimeter. The highest levels of contamination were detected in samples collected from the FG borings during Phase II of the RFI, and from wells G-314 and G-332. Compounds exceeding Class II Groundwater Quality Standards (35 IAC 620.420) included benzene, 1,1-dichloroethylene, vinyl chloride, toluene, trichloroethylene, pentachlorophenol, phenol, chloride, sulfate, iron, and lead. Numerous other volatile and semivolatile organic compounds as well as metal compounds were detected in groundwater samples collected within the former SWMU. Overall, metal compounds were detected below Class II Groundwater Quality Standards. Groundwater Quality Standards do not exist for most of the organic compounds detected in the groundwater samples. Groundwater samples collected at these locations represent groundwater quality located within the former SWMU. Significantly lower levels were detected in samples collected from upgradient wells G-307 and G-334 located along the eastern property line. The concentration of chloride, sulfate and lead exceeded Class II Groundwater Quality Standards in RFI Phase I samples, but not in RFI Phase II samples.

Downgradient sample locations included wells G-123S, G-305 and G-330, and a groundwater sample collected from the FG-4 boring located near G-330. G-123S is located on the west side of the former SWMU upgradient to the closed interim surface impoundments. G-123S, G-305, and G-330 are located between the former SWMU and Lake Calumet. Constituents detected in groundwater samples collected from well G-305 were similar to the concentration of constituents detected in samples collected from upgradient wells. No constituents were detected above Class II Groundwater Quality Standards. However, concentrations of volatile and semivolatile compounds exceeding background concentrations were detected in groundwater samples collected from G-123S, G-330, and FG-4. Class II Groundwater Quality Standards were exceeded for benzene, 1,1-dichloroethylene, trichloroethylene, vinyl chloride, phenol, chloride, iron, and lead in the RFI Phase I sample. Benzene, 1,1-dichloroethylene, phenol, and vinyl chloride exceeded Groundwater Quality Standards in samples collected during RFI Phase II.

During each phase of the investigation, soil samples from each boring were collected from the base of the former SWMU and from the horizon above the clay fill contact. Samples collected from the base of the SWMU during RFI Phase I were named by sample location and the suffix "F1". During Phase II, the "S" suffix was used to denote samples collected at the base of the SWMU. The "F2" and "D" suffixes were used to denote samples collected above the clay-fill contact during RFI Phase I and II, respectively. Laboratory results for soil samples collected during RFI Phase I are summarized in Tables 2-4A, 2-4B, and 2-4C. A summary of soil samples collected during RFI Phase II are summarized in Tables 2-5A, 2-5B, and 2-6.

As shown in Tables 2-4 (A through C) and 2-5 (A and B), elevated levels of volatile and semivolatile organic compounds, and metals were detected in fill samples collected at both horizons. Laboratory results indicated that volatile and semivolatile organic contaminants resulting from past waste disposal activities remained in place following closure of the SWMU. Metal compounds were detected in soil samples collected at upgradient sample locations, indicating that metals are a component of the fill material, and not the result of past waste disposal practices.

2.2.2 SWMU #2 - Activated Sludge Basins

The Activated Sludge Basins were constructed by Hyon in the early 1970s. The former SWMU was located west of the Biochemical Filter Beds (SWMU #1), and north of the Drum Storage Area (SWMU #3) as shown on Figure 2-2. In 1987, the sludge basins and clarifier were removed. Soil beneath the SWMU was also excavated to the water table (approximately 8 feet). The excavated soil and construction debris were tested for hazardous characteristics and for EP Toxicity. Test results indicated that the material tested was not classified as hazardous waste. The excavated soil and construction debris were transported and disposed off site at the CID Landfill as non-hazardous waste (ref. 5).

The Phase IV Water Treatment (water cooling and storage) facility is currently located where SWMU #2 was located. Consequently, no soil or groundwater samples were collected from beneath the former SWMU during the RFI. Soil samples were collected from borings advanced near the west end of SWMU #1 (FG-1, FG-2, and B-312) near SWMU #2. Groundwater samples were collected from the FG-1 and FG-2 borings during RFI Phase II in addition to the collection of groundwater samples collected from G-123S during both RFI phases.

Groundwater sample results are summarized in Tables 2-2 and 2-3, and soil sample results are summarized in Tables 2-4A and 2-5A. Contaminants detected in these samples are likely associated with past waste disposal practices at SWMU #1.

2.2.3 SWMU #3 - Drum Handling Area

The Drum Handling Area was constructed by Hyon in the early 1970s. This former SWMU was located south of SWMU #2 and west of SWMU #1 as shown in Figure 2-2. The facility was equipped with a warehouse for storage of containerized hazardous waste prior to transfer to bulk storage areas. The warehouse contained areas for drum storage, drum rinsing, and liquid transfer (ref. 5).

The Drum Handling Area was closed in accordance with the December 1981 closure plan prepared for SCA. Written documentation of the closure has been sought, but is not available. The Closure Plan required that drums stored in the SWMU be emptied, and their contents transferred to bulk storage tanks. Each drum would then rinsed, and the rinse water would then be collected, tested, and properly disposed. Drums would then be shipped to a landfill for disposal, or shipped to a drum re-conditioner for reuse depending upon the condition of the drum. Additionally, the floors and walls of the warehouse were to be decontaminated, and the rinsewater was tested, and properly disposed.

Samples collected from the former SWMU #3 area included soil samples collected from the B-321 and B-328 soil borings during RFI Phase I. As shown in Table 2-7, elevated concentrations of PAH compounds and metals were detected in these soil samples. Low levels of volatile organic compounds were also detected. With the exception of the metals, the concentrations of compounds detected in samples collected at the base of the SWMU exceeded the concentration of compounds detected at the clay/fill contact. (Samples with the F1 suffix were collected at the base of the SWMU, and samples with the F2 suffix were collected at the clay fill contact.)

2.2.4 SWMU #4 - High Solids Area

The High Solids Area was constructed by Hyon in the early 1970s. The former SWMU was located east of the former Wastewater Basin #1 (SWMU #5), and west of the closed interim stormwater retention and cooling water storage surface impoundments. Waste quantities within the SWMU are unknown. Based upon aerial photographs, records obtained from CWMCS, and the volume of material excavated from the SWMU, it is estimated that the basin held approximately 30,000 cubic yards (ref. 5).

The High Solids Area was closed as part of the 1981-1982 pier restoration project. All liquids were removed from the basin and properly disposed. Sludges were excavated, stockpiled temporarily on-site, and placed in the clay-lined vault constructed at the former SWMU #5 area.

Samples were collected from the High Solids Area in November 1980, prior to the pier restoration and submitted for laboratory analysis. The material did not display characteristics of corrosivity, reactivity, ignitability, or EP toxicity to qualify for classification as hazardous waste.

During Phase I of the RFI, seven (7) soil borings (G-303, G-307, B-310, B-311, B-320, B-325, and P-319) were advanced at locations within the former SWMUs as shown in Figures 2-1 and 2-2. Monitoring wells screened across the saturated fill material were installed in three of the borings (G-303, G-307, and P-319). Groundwater samples were collected from two of these wells (G-303 and G-307) during both phases of investigation. (Well P-319 was used for the collection of water level data only.) Groundwater sample results are summarized in Table 2-8. Soil samples collected from these soil borings advanced during RFI Phase I, and laboratory results from the FG-17 soil boring advanced during RFI Phase II are summarized in Table 2-9. Additionally, surface soil samples collected during RFI Phase II are summarized in Table 2-10. Surface soil sample locations are also shown on Figures 2-1 and 2-2.

Monitoring wells G-303 and G-337 are located between the former SWMU and Lake Calumet. Based upon the groundwater elevation measured in P-319, both wells are downgradient of the former SWMU. As shown in Table 2-8, low to moderate concentrations of volatile and semivolatile compounds and elevated concentrations of metals were collected in RFI Phase I groundwater samples. Chloride and lead exceeded Class II Groundwater Quality Standards in the sample collected from G-303 during RFI Phase I. Antimony, chloride, sulfate, and lead exceeded groundwater quality standards in the sample collected from G-337 collected during RFI Phase I. The concentration of volatile, semivolatile, and metal compounds in RFI Phase II groundwater samples were significantly lower. No Class II Groundwater Quality Standards were exceeded.

As shown in Table 2-9, elevated levels of volatile, semivolatile, and metal compounds were detected in soil samples collected from borings advanced within the SWMU. Contaminants were detected at the base of the former SWMU, and at the clay-fill contact. Laboratory soil sample results indicated that contaminants resulting from past waste disposal activities of the SWMU remained in place following closure of the SWMU in 1982. Contaminants in soil samples collected from soil borings and surface soil samples consist primarily of PAH compounds and metals. Groundwater sample results indicate that contaminants are present in the groundwater, but they are not necessarily migrating because of low permeability conditions within the fill soil.

2.2.5 SWMU #5 - Wastewater Basin #1/Vault

The Wastewater Basin #1 was constructed by Hyon in the early 1970s. This former SWMU is located west of SWMU #4, and east of SWMU #6 as shown in Figure 2-2. Waste quantities within the SWMU are unknown. Based upon aerial photographs, and records obtained from CWMCS, and the volume of material excavated from the SWMU, it is estimated that the SWMU was 17 feet deep and held approximately 5.8 million gallons (ref. 5).

Wastewater Basin #1 was closed as part of the 1981-1982 pier restoration project. All liquids were removed from the basin, and properly disposed. Sludges were excavated, stockpiled on site, and then placed in the clay-lined vault constructed with the former SWMU. Prior to excavation, samples of the sludge were submitted for laboratory analysis. The material did not display characteristics of corrosivity, reactivity, ignitability, or EP toxicity to qualify for classification as hazardous waste.

During RFI Phase I of the investigation, soil borings (G-302, G-318, and G-336) were advanced on the north, south, and east sides of the vault as shown in Figure 2-1. Monitoring wells G-302, G-318, and G-336 were installed in these borings with screens placed across the saturated fill material used to construct the pier. Groundwater samples were collected from these wells during both phases of the RFI, and laboratory results are summarized in Table 2-11. Leachate samples were also collected from the vault during both phases of investigation. Laboratory results are summarized in Table 2-12. Additionally, soil samples were collected from the G-318 and G-336 soil borings during RFI Phase I, and from four surface soil sample locations during RFI Phase II. Laboratory results for soil samples are summarized in Table 2-13 and Table 2-14.

As shown on Figure 2-2, the vault has been constructed where the former wastewater basin was located, and G-302 and G-336 are located between the vault and Lake Calumet. G-318 is located near the center of the pier west of the vault. Low concentrations of volatile organic compounds and moderate concentrations of semivolatile organic compounds and metals were detected in groundwater samples collected from these wells. Constituents detected in the groundwater samples in exceedance of Class II Groundwater Quality Standards include benzene, chloride, sulfate, antimony, cadmium, and lead. Laboratory results are summarized in Table 2-11.

Similar constituents were detected in soil samples collected from the G-318 and G-336 soil borings. Laboratory results are summarized in Table 2-12. Surface soil samples were also collected at four locations during RFI Phase II as shown on Figure 2-2. Low to moderate concentrations of volatile and semivolatile organic compounds and metals were detected in these soil samples. Laboratory results are summarized in Table 2-13.

Leachate samples were also collected from the vault during both phases of the RFI. Sample V-1 was collected during RFI Phase I, and analyzed for volatile organic compounds. The leachate samples collected during RFI Phase II (L-1 through L-4) were analyzed for the full Appendix IX compound List. Elevated concentrations of volatile organic compounds and moderate concentrations of semivolatile organic compounds and metals were detected in the leachate samples. Laboratory results are summarized in Table 2-14, and sample locations are shown on Figure 2-2.

Additionally, laboratory results of samples collected at locations in the vicinity of former SWMU #5 indicate that contaminants remained in the subsurface following closure of the former wastewater basin.

Contaminants detected in the leachate appear to be similar to contaminants detected at former SWMU locations.

2.2.6 SWMU #6 - Wastewater Basin #2

Wastewater Basin #2 was constructed by Hyon in the early 1970s. The former SWMU was located at the west end of the pier, immediately west of the Wastewater Basin #1 (SWMU #5). Waste quantities within the SWMU are unknown due to restricted access to Hyon records. Based upon aerial photographs, records obtained from CWMCS, and the volume of material excavated from the SWMU, it is estimated that the SWMU was the same size as Wastewater Basin #1. Both Wastewater Basins held approximately 5.8 million gallons and were 17 feet deep (ref. 5).

Wastewater Basin #2 was closed as part of the 1981-1982 pier restoration project. All liquids were removed from the basin, and properly disposed. Sludges were excavated, stockpiled on site, and placed in the clay-lined vault constructed within the former Wastewater Basin #1. Prior to excavation of sludges, samples were collected and submitted for laboratory analysis. The material did not display characteristics of EP toxicity to qualify for classification as hazardous waste.

During RFI Phase I, ten (10) soil borings (B-301, B-309, B-325, B-327, B-335, G-308, G-317, G-324, G-324A, and P-316) were advanced in the vicinity of the former SWMU at locations shown on Figure 2-1. Monitoring wells G-308, G-317, G-324, G-324A, and P-316 were installed in five of these borings with screens placed across the saturated fill. Wells G-324A and P-316 were used to monitor groundwater elevations only. Groundwater samples were collected from wells G-308, G-317, and G-324 during RFI Phase I and II. A groundwater sample was also collected from the FG-15 sample location during RFI Phase II. Constituents exceeding Class II Groundwater Quality Standards include benzene, 1,2-dichloroethane, 1,1-dichloroethylene, toluene, vinyl chloride, phenol, chloride, sulfate, antimony, barium, cadmium, and lead. Laboratory results for groundwater samples collected during both phases of investigation are summarized in Table 2-15.

Similar constituents were detected in soil samples. Soil sample results collected from borings advanced during both phases of the investigation have been summarized in Table 2-16. Additionally, surface soil samples were collected during RFI Phase II. These results are summarized in Table 2-17.

2.2.7 SWMU #7 - Chemical Treatment Area

The Chemical Treatment Area was constructed by Hyon in the early 1970s. This former SWMU is located north of the incinerator, south of the Biochemical Filter Beds (SWMU #1), and east of SWMU #8 as shown on Figure 2-2. The quantity of wastes handled in the area is unknown. Written documentation on the closure of this SWMU is not available (ref. 5).

Soil samples were collected from two borings (B-339 and B-341) advanced in the vicinity of the former SWMU during RFI Phase I. Laboratory results for these samples are presented in Table 2-4B. Soil and groundwater samples were also collected from the FG-6 boring advanced northeast of the former SWMU. Laboratory results for samples collected from the FG-6 boring are presented in Tables 2-3 and 2-5B.

Elevated concentrations of volatile and semivolatile compounds, as well as metal compounds, were detected in soil samples collected from B-339 and B-341. Semivolatile organic compounds consisted primarily of PAH compounds. Similar compounds were detected in samples collected from the FG-6 boring. However, contaminants detected in soil samples collected from these borings may be the result of waste management practices at the former Biochemical Filter Beds (SWMU #1) , the Chemical Treatment Area (SWMU #7), or the Biochemical Treatment Area (SWMU #8).

2.2.8 SWMU #8 - Biochemical Treatment Area

The Biochemical Treatment Area was constructed by Hyon in the early 1970s. This former SWMU was located west of SWMU #7, north of the Hyon Tank Farm (SWMU #10), and south of SWMU #1 as shown in Figure 2-2. Written documentation regarding waste handling, treatment, and storage at the SWMU has been sought, but is not available. Written documentation regarding the closure of the SWMU has also been sought, but is not available.

Three soil borings were advanced in the vicinity of the former SWMUs during Phase I and Phase II of the RFI. Laboratory results for soil samples collected from the three soil borings (B-340, B-341, and FG-5) are included in Tables 2-4B and 2-5A. Laboratory results of a groundwater sample collected from FG-5 are included in Table 2-3.

Volatile and semivolatile organic compounds, as well as metal compounds, were detected in soil samples collected from the B-340, B-341, and FG-5 borings. As with the soil samples collected in the vicinity of SWMU #7, semivolatile organic compounds consist predominantly of PAH compounds. The highest levels of contaminants were detected in samples collected from the B-341 boring. Contamination detected at the B-340, B-341, and FG-5 borings may be the result of waste management practices at the former Biochemical Filter Beds (SWMU #1), the Chemical Treatment Area (SWMU #7), or the Biochemical Treatment Area (SWMU #8).

2.2.9 SWMU #9 - Process Water Underground Pipe System

The Process Water Underground Pipe System consisted of an underground pipeline constructed by Hyon in the early 1970s. The pipeline was used to transport incinerator scrubber water between the surface impoundments and the incinerator. The underground pipeline was abandoned in place, and replaced by an aboveground pipeline. As shown in Figure 2-2, the abandoned pipeline route originated at the incinerator and proceeded north to the south end of SWMU #1 and east of SWMU #8. From there, the pipeline proceeded west between SWMU

#1 and SWMU #8, on then north to the activated sludge basins (SWMU #2) between the closed interim surface impoundments and SWMU #3 (ref. 5).

Documentation regarding the construction specifications, present integrity, abandonment procedures, and the material transported in the pipeline during its use are not available due to the restricted Hyon records. However, several failures of the underground pipeline were documented. The largest release occurred in 1984 at the elbow near the northeast interim surface impoundment near former SWMU #2. Contaminated soil resulting from the release was excavated and disposed at a landfill (ref. 7). No soil or groundwater samples were collected along the former pipeline route during either phase of the RFI.

2.2.10 SWMU #10 - Hyon Tank Farm

The Hyon Tank Farm was constructed by Hyon in the early 1970s. The tank farm was used for the storage of liquid wastes prior to treatment or disposal at other SWMUs operated during Hyon's tenure. The earthen berm surrounding the tank farm, and the Hyon tanks are no longer in existence. The tank farm was closed in accordance to a 1981 Closure Plan by SCA (ref. 5). However, written documentation regarding closure has been sought, but is not available. As shown in Figure 2-2, the existing on-site tank farm is located in the vicinity of the former Hyon Tank Farm.

Soil and groundwater samples were collected from soil borings and monitoring wells installed in the vicinity of the former SWMU. RFI sample locations are shown on Figure 2-1. Laboratory results for groundwater samples are summarized in Tables 2-18 and 2-19, while laboratory results for soil samples are summarized in Tables 2-20 and 2-21.

During Phase I of the RFI, soil borings B-345, B-346, G-344, and G-348 were advanced in the vicinity of the former SWMU. The G-344 boring was also advanced at a downgradient location between the former SWMU and Lake Calumet. Soil samples were collected from all soil borings, and monitoring wells also installed at the G-344 and G-348 locations with well screens placed across the saturated portion of the fill material used to construct the pier. Additionally, monitoring wells G-343, G-347, and G-349 were installed at upgradient locations.

As shown in Table 2-18, constituents exceeding Class II Groundwater Quality Standards included benzene, 1,2-dichloroethane, tetrachloroethylene, vinyl chloride, pentachlorophenol, phenol, chloride, sulfate, cadmium, iron, lead, and thallium. Benzene, tetrachloroethylene, phenol, chloride, cadmium, lead, and thallium exceeded groundwater quality standards in the sample collected from upgradient well G-349. As shown in Table 2-19, Class II groundwater quality standards were exceeded for benzene, 1,2-dichloroethane, 1,1-dichloroethylene, tetrachloroethylene, vinyl chloride, styrene, pentachlorophenol, and phenol for samples collected from monitoring wells. Elevated concentrations of these compounds were detected in the groundwater sample collected from FG-14, as well as numerous other volatile and semivolatile compounds. Constituents exceeding Class II groundwater quality standards in the FG-14 sample included the following: benzene, 1,2-dichloroethane, 1,1-dichloroethylene, tetrachloroethylene, toluene, 1,1,1-trichloroethylene, 1,1,2-trichloroethane, trichloroethylene, pentachlorophenol, phenol, styrene, and xylenes.

As shown in Tables 2-20 and 2-21, similar volatile and semivolatile organic compounds were detected in soil samples collected from soil borings advanced in the vicinity of the former Hyon Tank Farm. The highest levels of contamination were detected in samples collected at the FG-12 and FG-14 boring locations. Metals were detected at elevated concentrations at all locations. Metals are likely a composition of the fill material used to construct the pier rather than a result of past waste management activities.

2.3 Clay Soil Sampling Results

During both Phases of the RFI, soil samples collected from the fill material and underlying soil were selected for laboratory analysis. Native soils encountered beneath the fill material used to construct the pier consists of fine grained low permeability clayey lacustrine and glacial fill deposits. Consequently, native soil samples were referred to as "clay samples" while samples collected from the fill material used to construct the pier were referred to as "fill samples".

Low to moderate concentrations of volatile and semivolatile organic compounds were detected in clay samples collected during RFI Phase I. However, cross-contamination from the contaminated overlying fill material was suspected. During RFI Phase II, clay samples were collected from borings advanced through the fill at three horizons, 5, 15, and 40 feet below the clay-fill contact. To prevent cross-contamination, temporary casing was installed in boreholes to seal off the contaminated fill from the underlying native soils. Laboratory results indicated that contaminants present in the overlying fill material have not migrated into the underlying native soil units. As shown in Tables 2-22, and 2-23, only low levels of volatile organic compounds and two phthalate compounds (semivolatile organic compounds) were detected in the clay samples collected from the intermediate and deep horizons. Only low levels of the two phthalate compounds were detected in samples collected from the shallow horizon. The Final RFI Report concluded that these volatile and semivolatile organic compounds were likely the result of laboratory contamination (ref. 5).

Metals were also detected in samples of the clay collected during Phase I and Phase II of the RFI. The Final RFI Report concluded that the metals detected in clay samples may be naturally occurring (ref. 5).

2.4 Lake Calumet Sediment and Surface Water Sample Results

Surface water and sediment samples were collected from Lake Calumet during both RFI Phase I and RFI Phase II. During RFI Phase I, thirty (S-1 through S-30) samples of sediment and five samples of surface water were collected. During RFI Phase II, ten sediment and 15 surface water samples were collected.

One volatile organic compound (methylene chloride) was detected in one surface water sample. However, the concentration was similar to the concentration of methylene chloride in trip blanks, and is likely attributed to laboratory contamination. Mercury was detected at a low concentration in another surface water sample. No other organic or metal compounds were detected. Results of surface water samples did not indicate significant levels of surface water contamination (ref. 5).

Laboratory results of sediment samples collected from Lake Calumet did not indicate the presence of any discernable immiscible or dissolved plumes originating from the CWMCS facility. PAH (polyaromatic hydrocarbons) compounds and metals were detected in samples collected during both phases of the RFI at concentrations consistent with previous investigations (ref. 14, 15). These previous studies indicate areas of heavy metal and PAH concentrations located throughout the lake system. Heavy metal concentrations appear to be highest in areas of low surface water flow or areas of sediment deposition. The highest concentration of metals and PAH compounds appear to be associated with runoff into the lake from Pullman Creek.

2.5 Air Sampling Results

As part of the RFI completed by Dames & Moore on behalf of CWMCS, air samples were collected to determine the potential for air emissions from ground surfaces at former SWMUs which were not covered by cultural features (i.e., buildings and pavements). These areas included the bio-beds (SWMU #1) which was characterized with the highest levels of contaminants at the former CWMCS property, the High Solid Basin (SWMU #4), and the former Wastewater Basin #2 (SWMU #6). The methods used to collect these are samples, and the results of the investigation are presented in Appendix Q of the Final RFI Report (ref. 5).

2.6 RFI Summary and Conclusions

Results of the RFI confirmed the presence of soil and groundwater contamination in the vicinity of the former Hyon SWMUs. Investigation results indicate that soil and groundwater contamination are limited to the fill material used to construct the pier. Soil samples collected from the clayey native soil units beneath the fill indicate that contaminants have not migrated vertically. Only two phthalate compounds were detected in clay samples collected five (5) feet below the clay-fill contact. Low level volatile organic compounds (VOCs) and phthalate compounds were detected in soil samples collected 15 and 40 feet below the clay-fill contact. However, these VOC and phthalate compounds are common laboratory artifacts, and likely the result of laboratory contamination rather than the migration of contaminants into the subsurface.

Lake Calumet sediment and surface water sample results further support the conclusion that contamination associated with past waste management activities is limited to the fill. Surface water sample results failed to detect a discernable plume in the vicinity of the CWMCS pier. Sediment samples from Lake Calumet contained PAH compounds and metals. However, laboratory results of samples collected near the pier were similar to results of samples collected at off-shore locations. Contaminants detected in Lake Calumet sediment samples are consistent with previous studies completed by the Hazardous Waste Research and Information Center (ref. 14). This study concluded that Pullman Creek, located on the west shore of Lake Calumet, is a significant source of contamination to lake sediments.

Soil samples of fill material and groundwater samples from the saturated portion of the fill were collected during the RFI within and in the vicinity of the former Hyon SWMUs. Laboratory results identified numerous volatile and semivolatile organic compounds as well as metals in the subsurface at the facility. The highest levels of soil and groundwater contamination were detected in the vicinity of SWMU #1 (Biochemical Filter Beds), SWMU #4 (High Solids Basin), SWMU #6 (Wastewater Basin #2), and SWMU #10 (Hyon Tank Farm).

Additionally, air sampling results were used to calculate air emissions at each SWMU. The study concluded that volatile organic compound emissions from the ground surface at each SWMU were low, and that worst case long-term exposure to such emissions does not present any health risks (ref. 5).

3.0 GROUNDWATER QUALITY STANDARDS

3.1 Introduction

In accordance with Section V.D.5. of the Clean Harbors modified RCRA Part 3 Permit, the purpose of this section is to provide a discussion of the Illinois Administrative Code (IAC) Title 35, Part 620.420 Groundwater Quality Standards for Class II Groundwater that have been exceeded in groundwater samples collected during the RFI.

3.2 Results

A summary of groundwater monitoring parameters and their respective concentrations that have exceeded 35 IAC 620.420 Groundwater Quality Standards for Class II Groundwater (General Resource) for each SWMU investigated during the RFI is provided below.

3.2.1 SWMU #1 - Biochemical Filter Beds

Groundwater samples were collected from seven (7) monitoring wells during both phases of the RFI in the vicinity of SWMU #1 (Biochemical Filter Beds). Wells G-307 and G-334 are located upgradient (east of the former SWMU), and G-123S is downgradient (west of the former SWMU). Wells G-305 and G-330 are located between the former SWMU and Lake Calumet while wells G-314 and G-332 are located within the former SWMU. Laboratory results are summarized in Table 2-2 and sample locations are shown on Figure 2-2. A summary of constituents and their respective concentrations that exceeded Part 620.420 Groundwater Quality Standards based on the Phase I RFI data are as follows:

Constituents	Samples (Concentrations)	Part 620.420 Groundwater Standard
Barium	G-332 (2,860 μg/L)	2,000 μg/L
Benzene	G-123S (257 μg/L)	25 μg/L
	G-314 (596 μg/L)	25 μg/L
	G-330 (34 μg/L)	25 μg/L
	G-332 (20,900 μg/L)	25 μg/L
Cadmium	G-332 (76 μg/L)	50 μg/L
Chloride	G-123S (2,092 mg/L)	200 mg/L
	G-307 (254 mg/L)	200 mg/L
	G-314 (2,432 mg/L)	200 mg/L
	G-330 (371 mg/L)	200 mg/L
	G-332 (700 mg/L)	200 mg/L
	G-334 (425 mg/L)	200 mg/L
1,1-Dichloroethene	G-123S (4,730 μg/L)	35 μg/L
	G-314 (3,340 μg/L)	35 μg/L
	G-330 (539 μg/L)	35 μg/L
	G-332 (358,000 μg/L)	35 μg/L
Iron	G-330 (53,400 μg/L)	5,000 μg/L
	G-332 (317,000 μg/L)	5,000 μg/L
Lead	G-123S (110 μg/L)	100 μg/L
	G-307 (820 μg/L)	100 μg/L
	G-314 (620 μg/L)	100 μg/L
	G-330 (210 μg/L)	100 μg/L
	G-332 (2,000 μg/L)	100 μg/L
	G-334 (590 μg/L)	100 μg/L
Phenol	G-314 (403 μg/L)	100 μg/L
	G-332 (4,590 μg/L)	100 μg/L
Sulfate	G-307 (1,130 mg/L)	400 mg/L
	G-334 (1,400 mg/L)	400 mg/L
Toluene	G-332 (14,700 μg/L)	2,500 μg/L
Trichloroethene	G-330 (70.8 μg/L)	25 μg/L

Vinyl Chloride	G-123S (6,500 μg/L)	10 μg/L
	G-314 (14,500 μg/L)	10 μg/L
	G-330 (1,100 μg/L)	10 μg/L
	G-332 (271,000 μg/L)	10 μg/L

A second round of groundwater samples were collected from SWMU #1 monitoring well during RFI Phase II. In addition, groundwater samples were collected from ten (10) soil borings advanced within the former SWMU during RFI Phase II. Laboratory results are summarized in Table 2-3.

A summary of constituents and their respective concentrations that exceeded Part 620.420 Groundwater Quality Standards within SWMU #1 based on the Phase II RFI data are as follows:

Constituents	Samples (Concentrations)	Part 620.420 Groundwater Standard
Antimony	FG-3GW (120 μg/L)	24 μg/L
Arsenic	FG-3GW (620 μg/L)	200 μg/L
Benzene	G-123S (312 μg/L)	25 μg/L
	G-314 (1,050 μg/L)	25 μg/L
	G-330 (37.6 μg/L)	25 μg/L
	FG-1GW (64 μg/L)	25 μg/L
	FG-5GW (4,260 μg/L)	25 μg/L
	FG-7GW (2,430 μg/L)	25 μg/L
Benzo(a)pyrene	FG-3GW (15.0 μg/L)	2 μg/L
1,1-Dichloroethene	G-314 (3,500 μg/L)	35 μg/L
	G-330 (237 μg/L)	35 μg/L
	G-332 (2,240 μg/L)	35 μg/L
	FG-1GW (2,450 μg/L)	35 μg/L
	FG-2GW (55.8 μg/L)	35 μg/L
	FG-4GW (46.3 μg/L)	35 μg/L
	FG-5GW (52,300 μg/L)	35 μg/L
	FG-7GW (74,200 μg/L)	35 μg/L
	FG-9GW (46,900 μg/L)	35 μg/L

Pentachlorophenol	FG-3GW (25.4 μg/L)	5 μg/L
	FG-5GW (260 μg/L)	5 μg/L
Phenol	G-123S (1,810 μg/L)	100 μg/L
	G-332 (2,330 μg/L)	100 μg/L
	FG-1GW (868 μg/L)	100 μg/L
	FG-2GW (126 μg/L)	100 μg/L
	FG-3GW (5,490 μg/L)	100 μg/L
	FG-4GW (577 μg/L)	100 μg/L
	FG-5GW (7,510 μg/L)	100 μg/L
	FG-6GW (1,400 μg/L)	100 μg/L
	FG-7GW (19,900 μg/L)	100 μg/L
	FG-8GW (668 μg/L)	100 μg/L
	FG-9GW (10,100 μg/L)	100 μg/L
Toluene	FG-5GW (5,570 μg/L)	2,500 μg/L
1,1,2-Trichloroethane	FG-5GW (1,800 μg/L)	50 μg/L
	FG-9GW (134,000 μg/L)	50 μg/L
Trichloroethene	FG-5GW (284 μg/L)	25 μg/L
	FG-9GW (1,200 μg/L)	25 μg/L
Vinyl Chloride	G-123S (33.3 μg/L)	10 μg/L
	G-314 (2,250 μg/L)	10 μg/L
	G-330 (80.5 μg/L)	10 μg/L
	G-332 (441 μg/L)	10 μg/L
	FG-1GW (445 μg/L)	10 μg/L
	FG-2GW (26.1 μg/L)	10 μg/L
	FG-4GW (21.7 μg/L)	10 μg/L
	FG-5GW (1,410 μg/L)	10 μg/L
	FG-7GW (6,050 μg/L)	10 μg/L
	FG-9GW (7,700 μg/L)	10 μg/L

3.2.2 SWMU #2 - Activated Sludge Basins and SWMU #3 - Drum Handling Area

As indicated in Sections 2.2.2 and 2.2.3, no groundwater samples were collected from SWMU #2 (Activated Sludge Basins) or SWMU #3 (Drum Handling Area) as part of the RFI.

3.2.3 SWMU #4 - High Solids Area

Groundwater samples were collected from two monitoring wells during both phases of the RFI. Both wells are located between the former SWMU and Lake Calumet. Well G-303 is north of the former SWMU while G-337 is south of the former SWMU. Laboratory results are summarized in Table 2-8. A summary of constituent concentrations and respective sample locations that exceeded Part 620.420 Groundwater Quality Standards as part of the Phase I RFI of SWMU #4 (High Solids Area) are as follows:

Constituents	Samples (Concentrations)	Part 620.420 Groundwater Standard
Antimony	G-337 (58 μg/L)	24 μg/L
Chloride	G-303 (492 mg/L)	200 mg/L
	G-337 (476 mg/L)	200 mg/L
Lead	G-303 (210 μg/L)	100 μg/L
	G-337 (490 μg/L)	100 μg/L
Sulfate	G-337 (552 mg/L)	400 mg/L

No constituents detected in groundwater samples collected during Phase II exceeded Part 620.420 Groundwater Quality Standards.

3.2.4 SWMU #5 - Wastewater Basin #1/Vault

Groundwater samples were collected from three (3) monitoring wells during both phases of the RFI. Well G-318 is located between SWMU #5 (Wastewater Basin #1/Vault) and SWMU #4. Well G-302 is located north of the vault, and G-336 is located south of the vault. Both well G-302 and G-336 are located between the former Wastewater Basin #1/Vault area and Lake Calumet. Laboratory results are summarized in Table 2-11. A summary of Phase I RFI constituent concentrations and associated sample locations within SWMU #5 (Wastewater Basin #1 / Vault) that exceeded Part 620.420 Groundwater Quality Standards are as follows:

Constituents	Samples (Concentrations)	Part 620.420 Groundwater Standard
Antimony	G-302 (99 μg/L)	24 μg/L
	G-318 (50 μg/L)	24 μg/L
Benzene	G-302 (80.4 μg/L)	25 μg/L
	G-336 (111 μg/L)	25 μg/L
Cadmium	G-302 (60 μg/L)	50 μg/L
Chloride	G-302 (531 mg/L)	200 mg/L
	G-318 (294 mg/L)	200 mg/L
	G-336 (593 mg/L)	200 mg/L
Lead	G-302 (2,400 μg/L)	100 μg/L
	G-318 (350 μg/L)	100 μg/L
	G-336 (1,100 μg/L)	100 μg/L

Benzene was the only compound to exceed Part 620.420 Groundwater Quality Standards for samples collected during RFI Phase II. Concentrations are as follows:

Constituents	Samples (Concentrations)	Part 620.420 Groundwater Standard
Benzene	G-302 (40.9 μg/L)	25 μg/L
	G-336 (69.0 μg/L)	25 μg/L

3.2.5 SWMU #6 - Wastewater Basin #2

Groundwater samples were collected from three (3) monitoring wells during both phases of the RFI, and from soil boring FG-15 during Phase II. Well G-317 is located near the center of the former SWMU and soil boring FG-15 was advanced near the east end of the SWMU. Well G-308 is located near the northwest corner of the former SWMU and well G-324 is located near the southwest corner of the former SWMU. Both wells are located between the former SWMU and Lake Calumet. Laboratory results for RFI Phase I and Phase II have been summarized in Table 2-15. A summary of constituents and their respective concentrations that exceeded Part 620.420 Groundwater Quality Standards based on RFI Phase I data are as follows:

Constituents	Samples (Concentrations)	Part 620.420 Groundwater Standard
Antimony	G-317 (510 μg/L)	24 μg/L
Barium	G-317 (2,010 μg/L)	2,000 μg/L
Benzene	G-317 (31.2 μg/L) G-324 (71.9 μg/L)	25 μg/L 25 μg/L
Cadmium	G-308 (56 μg/L)	50 μg/L
Chloride	G-308 (417 mg/L) G-317 (219 mg/L) G-324 (1,124 mg/L)	200 mg/L 200 mg/L 200 mg/L
1,2-Dichloroethane	G-324 (47.7 μg/L)	25 μg/L
Lead	G-308 (1,900 μg/L) G-317 (830 μg/L) G-324 (3,700 μg/L)	100 μg/L 100 μg/L 100 μg/L
Phenol	G-308 (236 μg/L) G-317 (378 μg/L) G-324 (715 μg/L)	100 μg/L 100 μg/L 100 μg/L
Sulfate	G-324 (510 mg/L)	400 mg/L
Vinyl Chloride	G-324 (46.7 μg/L)	10 μg/L

A summary of constituents and their respective concentrations that have exceeded Part 620.420 Groundwater Quality Standards based on RFI Phase II data are provided as follows:

Constituents	Samples (Concentrations)	Part 620.420 Groundwater Standard
Benzene	G-308 (34.2 μg/L)	25 μg/L
	FG-15 (482 μg/L)	25 μg/L
1,2-Dichloroethane	FG-15 (2,430 μg/L)	35 μg/L
Phenol	G-303 (553 μg/L)	100 μg/L
	G-317 (183 μg/L)	100 μg/L
Toluene	FG-15 (2,820 μg/L)	2,500 μg/L

3.2.6 SWMU #7 - Chemical Treatment Area, SWMU #8 - Biochemical Treatment Area, and SWMU #9 - Process Water Underground Pipe System

The Phase I and Phase II RFI did not include installation of monitoring wells or the collection of groundwater samples in the vicinity of SWMU #7, SWMU #8, or SWMU #9.

3.2.7 SWMU #10 - Hyon Tank Farm

Groundwater samples were collected from two (2) monitoring wells (G-344 and G-348) in the vicinity of the former Hyon Tank Farm (SWMU #10) during both phases of the RFI. Groundwater samples were collected from three (3) monitoring wells (G-343, G-347, and G-349) at upgradient locations during both phases of the RFI. During RFI Phase II, groundwater samples were also collected from four (4) soil borings (FG-11, FG-12, FG-13, and FG-14) advanced in the vicinity of SWMU #10. Laboratory results for RFI Phase I data has been summarized in Table 2-18, and laboratory results for RFI Phase II data has been summarized in Table 2-19. A summary of constituents and their respective concentrations that exceeded Part 620.420 Groundwater Quality Standards based on the RFI Phase I data are as follows:

Constituents	Samples (Concentrations)	Part 620.420 Groundwater Standard
Benzene	G-344 (212 μg/L)	25 μg/L
	G-348 (83 μg/L)	25 μg/L
	G-349 (41.3 μg/L)	25 μg/L
Cadmium	G-349 (56 μg/L)	25 μg/L
Chloride	G-343 (2,875 mg/L)	200 mg/L
	G-344 (1,320 mg/L)	200 mg/L
	G-347 (212 mg/L)	200 mg/L
	G-348 (1,024 mg/L)	200 mg/L
	G-349 (549 mg/L)	200 mg/L
1,2-Dichloroethane	G-344 (80.5 μg/L)	25 μg/L
Iron	G-348 (72,700 μg/L)	5,000 μg/L
Lead	G-343 (110 μg/L)	100 μg/L
	G-344 (180 μg/L)	100 μg/L
	G-347 (470 μg/L)	100 μg/L
	G-348 (840 μg/L)	100 μg/L
	G-349 (270 μg/L)	100 μg/L
Pentachlorophenol	G-344 (13.3 μg/L)	5 μg/L
Phenol	G-344 (4,290 μg/L)	100 μg/L
	G-348 (231 μg/L)	100 μg/L
	G-349 (350 μg/L)	100 μg/L
Sulfate	G-344 (835 mg/L)	400 mg/L
Tetrachloroethylene	G-349 (128 μg/L)	25 μg/L
Thallium	G-349 (20 μg/L)	20 μg/L
Vinyl Chloride	G-348 (954 μg/L)	10 μg/L

A summary of the constituents and their respective concentrations that exceeded Part 620.420 Groundwater Quality Standards near SWMU #10 based on the RFI Phase II data are as follows:

Constituents	Samples (Concentrations)	Part 620.420 Groundwater Standard
Benzene	G-349 (137 μg/L)	25 μg/L
	G-348 (119 μg/L)	25 μg/L
	G-349 (132 μg/L)	25 μg/L
	FG-12 (122 μg/L)	25 μg/L
	FG-13 (115 μg/L)	25 μg/L
	FG-14 (14,200 μg/L)	25 μg/L
1,2-Dichloroethane	G-348 (66.2 μg/L)	25 μg/L
	FG-12 (58.2 μg/L)	25 μg/L
	FG-14 (6,240 μg/L)	25 μg/L
1,1-Dichloroethylene	G-348 (43.4 μg/L)	35 μg/L
	FG-13 (97.8 μg/L)	35 μg/L
	FG-14 (39,800 μg/L)	35 μg/L
Pentachlorophenol	G-343 (9.06 μg/L)	5 μg/L
	G-344 (712. μg/L)	5 μg/L
Phenol	G-344 (3,570 μg/L)	100 μg/L
	G-349 (547 μg/L)	100 μg/L
Styrene	G-349 (1,980 μg/L)	500 μg/L
	FG-14 (4,180 μg/L)	500 μg/L
Tetrachloroethylene	G-349 (326 μg/L)	25 μg/L
	FG-14 (2,650 μg/L)	25 μg/L
Toluene	FG-14 (85,200 μg/L)	2,500 μg/L
1,1,2-Trichloroethane	FG-14 (28,600 μg/L)	60 μg/L
Trichloroethylene	FG-14 (2,220 μg/L)	25 μg/L
Vinyl Chloride	G-348 (32.5 μg/L)	10 μg/L
Xylene (total)	FG-14 (11,540 μg/L)	10,000 μg/L

3.3 Discussion

As described in the previous section, groundwater quality standards for several constituents detected in groundwater samples collected during the RFI have been exceeded. In response to these exceedances, an application for establishment of a Groundwater Management Zone must be performed in accordance with 35 IAC 620.250.

3.4 Application for Groundwater Management Zone

An application for establishment of a Groundwater Management Zone is included in Appendix D of this report.

4.0 PROPOSED SOIL AND GROUNDWATER CLEAN-UP OBJECTIVES

4.1 Groundwater Clean-up Objectives

Based on previous conversations with the IEPA, appropriate groundwater clean-up objectives for the Clean Harbors site (former CWMCS Chicago Incinerator Facility) are the Class II General Resource Groundwater Quality Standards identified in IAC Part 620.420. The groundwater constituents that exceeded Part 620.420 Class II General Resource Groundwater Standards, based on the RFI, are identified in Section 3.0 of this report. The associated Part 620.420 Class II General Resources Groundwater Quality Standards are summarized below:

Constituent	Part 620.420 Class II Groundwater Standard
Antimony	24 μg/L
Arsenic	200 μg/L
Barium	2,000 μg/L
Benzene	25 μg/L
Benzo(a)pyrene	2 μg/L
Cadmium	50 μg/L
Chloride	200 mg/L
1,2-Dichloroethane	25 μg/L
1,1-Dichloroethlyene	35 μg/L
Iron	5,000 μg/L
Lead	100 μg/L
Pentachlorophenol	5 μg/L
Phenol	100 μg/L
Styrene	500 μg/L
Sulfate	400 mg/L
Tetrachloroethylene	25 μg/L
Thallium	20 μg/L
Toluene	2,500 μg/L
1,1,1-Trichloroethane	1,000 μg/L
1,1,2-Trichloroethane	50 μg/L
Trichloroethylene	25 μg/L
Vinyl Chloride	10 μg/L
Xylene (total)	10,000 μg/L

4.2 Soil Clean-up Objectives

Based on previous conversations with the IEPA, site-specific soil clean-up objectives for the former Chicago Incinerator facility will be developed using the USEPA Risk-Based Corrective Action (RBCA) procedure. The USEPA Soil Screening Guidance document (EPA/540/R-94/101) will be used to develop clean-up objectives as they relate to protection of human health.

4.3 Implementation

If the IEPA determines that corrective measures must be taken in response to the soil and groundwater contamination identified during the RFI, Clean Harbors will develop a Phase I Corrective Measures Work Plan. The Work Plan will be developed in accordance with procedures set forth in Attachment K of the Clean Harbors modified RCRA Part B Permit. Phase I of the Corrective Measures Program will consist of the following:

1. Development of final cleanup objectives;

2. Identification of those SWMUs requiring corrective action; and

3. A preliminary evaluation of the corrective action alternatives available for each SWMU requiring corrective action.

Final groundwater clean-up objectives will include Class II General Resource Groundwater Quality Standards for the compounds listed in Section 4.1. For those compounds with no Groundwater Quality Standards, Alternative Groundwater Quality Standards will be developed in accordance with 35 IAC 620.450 requirements.

Final soil cleanup objectives will be determined using the procedure defined above according to the USEPA guidance Risk Based Cleanup Action (RBCA).

5.0 POTENTIAL CORRECTIVE MEASURES

5.1 Introduction

Potential corrective measures for the facility were presented in Part Two of the Final RFI Report (ref. 5). This evaluation was completed as a preliminary method to identify data needs for a Corrective Measures Study.

Potential corrective measures technologies were screened, eliminating those corrective measures which have severe practical or technical limitations for site specific conditions. Potential corrective measures were reviewed and the feasibility of each option to protect human health and the environment, as well as the relative cost (e.g., low, moderate, or high) and acceptability of the method, were evaluated. Primary considerations used in assessing potential corrective measures included the following:

- Technical Feasibility;
- Implementation Feasibility;
- Environmental Feasibility; and
- Economic Feasibility.

The technical feasibility of a corrective measure is evaluated with respect to site conditions. This includes the hydrogeologic conditions, characteristics of soil units, extent of contamination, and contaminant migration pathways. The implementation feasibility is evaluated on the basis of design considerations, equipment requirements, treatment and disposal requirements, monitoring requirements, and permitting requirements. Environmental feasibility is the evaluation of potential adverse impacts associated with the corrective measure. This includes an assessment of the need and feasibility of remediating all environmental media and assessing exposure pathways. This assessment includes evaluation of the potential impacts in the absence of remediation. The economic feasibility of implementing various corrective measures was also assessed. Economic feasibility is based on a comparison of the relative costs associated with implementing each of the options. This includes an evaluation of the cost/cleanup effectiveness of each option. Economic considerations include capital expenditures, design and installation costs, and operation and maintenance costs.

5.2 Screening of Corrective Measures

If the IEPA determines that corrective measures must be undertaken, potential corrective measures will be evaluated in accordance with Attachment K of the Clean Harbors Modified RCRA Part B Permit. During Phase I of the Corrective Measures Program, options for containment, treatment, remediation, and/or disposal of contamination will be evaluated. Corrective measures that may be used to achieve this objective can be divided into six categories as follows:

- No Action;
- Containment;
- Remediation;
- Treatment;
- Disposal; and
- Resource Management.

Appropriate corrective measures may include one or a combination of these categories. A brief description of potential corrective actions by category is presented below.

No Action

This option assumes that no additional work is required. The no action alternative does not appear to be a feasible option for the former Chicago Incinerator facility as a whole, at this time, unless alternative groundwater quality standards are developed. However, this alternative could be applied to specific units or portions of the facility. A no action corrective measure will be re-evaluated following development of final groundwater and soil clean-up objectives.

Containment

Containment is the control of migration of contaminants onto or from the facility. This control prevents the potential for exposure to contamination and prevents additional areas from becoming contaminated. Containment is accomplished by utilizing engineering controls applicable to site conditions to create impermeable barriers. Engineering controls include slurry walls, sheet pilings, grout curtains, or capping. Containment is a feasible option and is evaluated in Section 5.3.

Remediation

Remediation is the restoration of the site to original conditions, or to an acceptable level such that little or no risk to human health and the environment results. Restoring the former Chicago Incinerator facility to original conditions (a lake bed) is not a feasible option. However, restoration of the site to an acceptable level is a feasible option and is evaluated in Section 5.3.

Treatment

Treatment is a process that removes, separates, or reduces the toxicity of harmful constituents from the contaminated media (*i.e.*, soil and groundwater). This is accomplished by a variety of physical, chemical, and biological processes. Several treatment options are feasible. These are evaluated with remediation alternatives in Section 5.3.

Disposal

Disposal implies removal of the contaminant source and/or contaminated media, followed by off-site or on-site long term storage of potentially harmful constituents to protect human health and the environment. For contaminated soils, this means removal by excavation or other viable means and placement of the material in a landfill. Deep well injection is a disposal option for contaminated groundwater. Disposal does not appear to be a feasible corrective measure at this time.

Resource Management

Resource management involves various regulatory and administrative decisions intended to limit or prevent exposure of potentially harmful constituents to human health and the environment. This can be accomplished by a combination of corrective measures. Resource management has been evaluated in Section 5.3.

5.3 Potential Corrective Measures Option

5.3.1 Containment

Installation of an impermeable barrier around the perimeter of the former Chicago Incinerator facility (or around selected SWMUs), in conjunction with a cap to reduce infiltration, is technically feasible. The fill unit is in direct hydraulic connection with Lake Calumet. As a unit, the fill material is a potential contaminant migration pathway. Horizontal migration of contaminants via groundwater is the primary mechanism for potential off-site contamination. However, the fact that there is a negligible release of contamination to Lake Calumet, warrants further consideration whether containment around the entire facility is necessary to reduce future releases of potentially harmful constituents into Lake Calumet.

Containment is a proven and effective technology. The implementation of an impermeable barrier around the perimeter of the facility, or selected SWMUs, such as a slurry wall, is feasible. A low permeability clay layer 15 to 20 feet beneath the fill provides a vertical barrier to contaminant migration. A low permeability cap such as compacted clay, asphalt, or concrete may reduce infiltration substantially. Further remedial measures, such as pumping and treating groundwater may also be part of this system. A detailed evaluation of this option will be completed as Phase II of the Corrective Measures Program.

Potentially harmful constituents are not destroyed or reduced with containment. However, containment is environmentally feasible since exposure of harmful constituents to human health and the environment are significantly reduced. Containment is also economically feasible. Design and installation costs relative to other corrective measures would be moderate. Operation and maintenance costs would be low.

There are several factors which also must be considered when evaluating this corrective measure. Future land use would be restricted to preclude unnecessary exposure to harmful constituents contained within the property boundaries of the facility. This is consistent with existing land use restrictions imposed by deed restrictions required by RCRA and the responsibilities associated with post-closure activities by RCRA regulated land disposal units. Such restriction would require the approval of the property owner (the Illinois International Port District). Material used to construct the impermeable barrier must be compatible with the concentrations and types of contamination identified at the facility. Bench scale studies, literature reviews, or information provided by vendors are needed to select a compatible material of which to construct containment barriers.

5.3.2 Remediation

Remediation or site restoration to an acceptable level of risk is technically feasible. Goals for an acceptable level of site restoration should be defined following approval of the Risk Assessment. Corrective measures to be evaluated for site restoration include the following:

- Groundwater Extraction and Treatment
- Soil Vapor Extraction
- Air Sparging
- Solidification/Stabilization and/or Encapsulation
- Bioreclamation

Groundwater Extraction and Treatment

Groundwater extraction and treatment is a technically feasible option for remediating groundwater contamination in the uppermost water bearing unit. Implementation of a groundwater extraction system using horizontal subsurface drains would be more feasible than vertical extraction wells. This is based on the shallow depth to groundwater, wide range of permeability, and size of the facility. Groundwater extraction should be concentrated in areas with significant groundwater contamination, such as the biobed areas (SWMU #1). Placing subsurface drains below the elevation of Lake Calumet would create a sink, reversing the direction of groundwater flow.

Groundwater extraction is environmentally feasible since contaminants are removed from the fill, and the potential migration of contaminants will be controlled. However, some constituents will adhere to soil particles and residual contamination would remain. Additionally, groundwater extraction may take 20 to 30 years of operation to complete. Remediation could be completed much sooner if containment barriers were installed reducing infiltration and recharge from Lake Calumet and off-site upgradient sources. Design and installation costs would be moderate. Operation and maintenance costs relative to other corrective measures would be moderate to high. These costs are dependent on the duration of pumping required to remediate the facility. The longer the system is in operation, the higher the costs incurred.

The major limitation of a groundwater extraction corrective measure would be the treatment of contaminated water or the permitting requirements for discharging the treated groundwater. A complex treatment system may be required to handle the wide range of both inorganic and organic constituents detected in groundwater samples collected during the investigation. A pilot test may be needed to determine flow rates and feasible treatment systems. Appropriate treatment systems include air stripping, activated carbon treatment, and discharge to the sanitary sewer.

Soil Vapor Extraction

Soil vapor extraction (SVE) uses air as a carrier to remove volatile constituents from the soil. This corrective measure is technically feasible, but has several limitations. An SVE system will not be effective at removing metals or semi-volatile compounds. Permitting may be required prior to discharging off-gases into the atmosphere. Treatment of off-gases may also be required. Because of the high water table conditions in the fill, an SVE system would necessarily be implemented in conjunction with a groundwater extraction and treatment system or with an air sparging system.

An SVE system would be most effective at treating sources of contamination where a high rate of reduction is needed, such as in the biobeds area, the high solids basin (SWMU#4), the wastewater basin #2 (SWMU#6), and the former Hyon tank farm area. Implementation is feasible for facility conditions. The SVE system would be most effective in areas with high concentrations of volatiles, in conjunction with a groundwater extraction system or air sparging (see next heading). The groundwater extraction system would lower the water table, and increase the area of SVE influence. SVE is an environmentally feasible method to remove contamination from the soil providing off-gases can be controlled or treated prior to release into the atmosphere.

Air Sparging

Air sparging is a process in which air is injected into the saturated zone to enhance VOC partitioning from the dissolved phase (water) into the gaseous phase (air). The gaseous VOCs are then conventionally collected by an SVE system (or in some cases allowed to migrate into the atmosphere). As with SVE, this corrective measure is technically feasible, but has several limitations. Air sparging will remove volatile organic compounds, but will not be effective at removing some semivolatile organic compounds and metals. Additionally, a large number of sparge points would be needed due to the heterogeneous nature of the fill material, and an expected small radii of influence.

Air sparging is most efficient when used in conjunction with an SVE system where a high rate of reduction is needed. Implementation is feasible, but costs for installation would be high due to the large number of sparge points required.

Solidification/Stabilization and Encapsulation

Solidification/stabilization (this method includes ex-situ bioreclamation) and encapsulation are both soil remediation potential corrective measures. These methods involve the excavation of contaminated soil, followed by mixing with material that alters the physical and/or chemical properties of the contaminated soil, rendering them less leachable and less toxic. Solidification/stabilization and encapsulation are both technically feasible for the CWMCS facility. Both are proven and effective technologies. Solidification has been performed at the facility as part of the pier restoration project in 1982. Implementation would be most effective for areas such as the biobeds area, the high solids basin and wastewater basin #2. Contaminated groundwater encountered in all excavations would have to be collected and treated. The establishment of a Corrective Action Management Unit (CAMU) would need to be approved so that materials can remain on-site. Pilot tests to determine a compatible material to mix with the soil may be required. Implementation would be limited to undeveloped areas. This method is environmentally feasible if proper measures are implemented to prevent human exposure or undesirable releases of potentially harmful constituents. Runoff, dust emissions, and vapor emissions would all have to be controlled. The cost to implement this corrective measure would be high since a large volume of material would be handled. Operation, monitoring, and maintenance costs would be low to moderate.

Bioreclamation (In-situ)

This potential corrective measure is a technique for treating zones of contamination by microbial degradation of constituents harmful to human health and the environment. This method is technically feasible and could be used to remediate contaminated groundwater and soil. Although microorganisms are naturally occurring, the process can be enhanced with the addition of hybrid microorganisms, oxygen, or nutrients. The most efficient implementation of a bioreclamation system would be the use of wells to inject nutrients, in conjunction with subsurface drains to collect groundwater downgradient from the injection point. Pilot studies may be required to determine the efficiency and feasible methods of implementation. Bioreclamation would not be effective at removing metals. This method is environmentally feasible in terms of reducing or destroying organic constituents. However, this would be a long term corrective measure, and long term monitoring may be required. Design and installation costs would be low to moderate. Monitoring, operation and maintenance costs would be moderate to high.

5.3.3 Resource Management

Resource management is a combination of corrective measures. Land use restrictions on the property will be in place due to the presence of engineered structures designed to provide long term containment for contaminated media, including the area of the former interim status surface impoundments and the vault. Future residential or recreational use of both Lake Calumet and facility is highly unlikely due to former and present land uses. Surface water or groundwater in the uppermost water bearing unit are not currently being used as a water supply, nor are they expected to be used as a water supply in the future.

These corrective measures protect human health by reducing potential exposure to potentially harmful constituents. The mobility, toxicity, or presence of harmful constituents will not be reduced. Resource management will be re-evaluated once the Risk Assessment has been approved. Additional studies or investigation may be required to fully assess these corrective measures.

5.4 Summary and Conclusions

Based on the current amount of information available following completion of the RFI, it appears that containment around the facility or specific SWMUs may be the most effective corrective measure. Bench scale studies, literature searches, and vendor information are needed to design a suitable barrier. The remaining corrective measures evaluated are long term remediation projects, would be complicated to implement, and have a lower reliability. Additionally, other corrective measures may be used to reduce the toxicity of soil and groundwater contamination within the contained area. A detailed evaluation of all corrective measures, including projected costs and subsequent environmental impacts of each, will be the focus of the Corrective Measures Program.

6.0 REFERENCES

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TABLES

Table 2-1
Summary of RFI Sample Locations
For Each SWMU

GROUNDWATER		FILL		SURFACE SOILS
Phase I	Phase II	Phase I	Phase II	
Biochemical Filter Beds (Biobeds) (SWMU #1)				
G123S	G123S	B-306	FG-1	SS-1
G305	G-305	B-312 (#2)	FG-2	SS-2
G307(u)	G-307(u)	B-313	FG-3	SS-3
G314	G-314	B-315	FG-4	SS-4
G330	G-330	B-331	FG-5 (#8)	SS-14
G332	G-332	B-333	FG-6(#7)	SS-15
G334(u)	G-334	B-339(#7)	FG-7	SS-16
	FG-1	B-340(#8)	FG-8	SS-17
	FG-2	B-341 (#7, #8)	FG-9	
	FG-3	G-305	FG-10	
	FG-4	G-307		
	FG-5	G-314		
	FG-6	G-330		
	FG-7	G-332		
	FG-8	G-334(u)		
	FG-9	P-323		
	FG-10	P-329		
Drum Storage Area (SWMU #3)				
		B-321		
		B-328		
High Solids Basin (SWMU #4)				
G-303	G-303	B-310	FG-17	SS-5
G-337	G-337	B-311		SS-20
		B-320		SS-21
		B-326		
		B-327		
		G-303		
		G-337		
		P-319		

(u) - Upgradient well.
(#2) - Also includes SWMU #2.
(#7) - Also includes SWMU #7.
(#8) - Also includes SWMU #8.

Table 2-1 (cont.) Summary of RFI Sample Locations For Each SWMU				
GROUNDWATER		**FILL**		**SURFACE SOILS**
Phase I	Phase II	Phase I	Phase II	
Wastewater Basin #1 and Vault (SWMU #5)				
G-302 G-318 G-336 V-1	G-302 G-318 G-336 L-1 L-2 L-3 L-4	G-318 G-336		SS-6 SS-10 SS-22 SS-23
Wastewater Basin #2 (SWMU #6)				
G-308 G-317 G-324	G-308 G-317 G-324 FG-15	B-301 B-309 B-325 B-335 G-308 G-317 G-324 G-324A P-316	FG-15 FG-16	SS-7 SS-8 SS-9 SS-18 SS-19
Hyon Tank Farm (SWMU #10)				
G-343(u) G-344 G-347(u) G-348 G-349(u)	G-343(u) G-344 G-347(u) G-348 G-349(u) FG-11 FG-12 FG-13 FG-14	B-345 B-346 G-343(u) G-344 G-347(u) G-348 G-349(u)	FG-11 FG-12 FG-13 FG-14	

(u) - Upgradient well.
(#2) - Also includes SWMU #2.
(#7) - Also includes SWMU #7.
(#8) - Also includes SWMU #8.

Table 2-2 Phase I RFI Groundwater Sample Results - SWMU #1								
Constituent	**G-123S**	**G305**	**G307**	**G314**	**G330**	**G332**	**G334**	**Groundwater Quality Standard**[1]
Volatiles GC/MS								
Acrolein					97.5			NS
Benzene	257			596	34	20,900		25
1,1-Dichloroethane					13			NS
1,1-Dichloroethylene	4,730			3,340	539	358,000		35
Methylene chloride	7,300	6.57	6.06	1,310	83	67,100	22.9	NS
Toluene	79.6				27	14,700		2,500
1,2-Trans-dichloroethylene	15				52.9			500
Trichloroethylene					70.8			25
Vinyl chloride	6,500			14,500	1,100	271,000		10
1,1,2 Trichloroethane	713							
Acids GC\MS								
2-Chlorophenol						76		NS
2,4-Dichlorophenol	334		4.56	35.7	22.6	493		NS
2,4-Dimethylphenol				3.28	1.7			NS
Phenol				403	22	4,590		100
B/Ns GC/MS								
Acenaphthene				0.88	1.2			NS
bis(2-Ethylhexyl)phthalate				9.3				NS
Di-n-butyl phthalate			0.39					NS
Fluoranthene					0.84			NS
Fluorene					1.3			NS
Naphthalene				2.61	6.2	46		NS
Phenathrene				0.68	2.4			NS
Pyrene					0.66			NS
GW Conventionals								
Chloride (mg/L)	2,092		254	2,432	371	700	426	200
Sulfate as SO4 (mg/L)	91.6		1,130	221	260	26.5	1,400	400
Metals Analysis Data								

Table 2-2 Phase I RFI Groundwater Sample Results - SWMU #1								
Constituent	**G-123S**	**G305**	**G307**	**G314**	**G330**	**G332**	**G334**	**Groundwater Quality Standard[1]**
Arsenic	16	16	130	150	39	180	94	200
Barium	1,500	130	1,000	1,400	220	2,860	550	2000
Beryllium	0.45	0.38	8.5	11	2.7	19	4.4	500
Cadmium	5.0	0.91	60	35	11	76	27	50
Calcium	387,000	384,000	1,350,000	1,200,000	179,000	910,000	1,050,000	NS
Chromium	59	30	210	180	78	390	96	1,000
Cobalt	5.1	24	170	81	27	100	65	1,000
Copper	35	46	350	180	88	460	200	650
Iron	15,200				53,400	317,000		5,000
Lead	110	57	820	620	210	2,000	590	100
Magnesium	180,000	129,000	453,000	218,000	70,700	177,000	262,000	NS
Mercury	0.24	0.19	0.43	0.52	0.37	1.6	0.79	10
Nickel	56	31	270	150	67	430	130	2,000
Potassium	231,000	22,000	72,900	160,000	29,000	120,000	128,000	NS
Selenium	6.2		2.6	9.2	8.7	19	3.3	50
Silver	5.4		32	16	6.3	21	17	NS
Sodium	742,000	93,900	169,000	442,000	236,000	265,000	176,000	NS
Thallium			5.9	7.5		8	3	20
Vanadium	38	39	340	300	120	730	180	NS
Zinc	130	120	1,200	1,400	360	2,900	860	10,000
Miscellaneous Parameters								
1,4-Dioxane	426		140					NS
2,4,5-T	1.04					1.09		NS
2,6-Dichlorophenol	100				5	64		NS
2-Methylnaphthalene					2.1			NS
Acetone	1,420	13.3	11.7	760	51	13,000	8.3	NS
Acetonitrile	18,700	275		3,210		1,860		NS
Acetophenone				1.7	0.77			NS
Dibenzofuran					0.63			NS

Table 2-2 Phase I RFI Groundwater Sample Results - SWMU #1								
Constituent	G-123S	G305	G307	G314	G330	G332	G334	Groundwater Quality Standard[1]
Ethyl Cyanide	52.6							NS
Isobutyl alcholol						3,720		NS
Methyl ethyl Ketone	402							NS
Methyl-iso-butyl ketone	221				22			NS
Pyridine				28	2.8			NS
Sulfide as S (mg/L)	1.2		2.3	2	4.7	11.3	1.6	NS
m+p-Cresols	310			243	30.7	440		NS

NS - No Standard
All results reported in μg/L unless otherwise noted.
[1] Title 35 IAC 620.420 Groundwater Quality Standards for Class II Groundwater.
Concentrations exceeding Class II Groundwater Quality Standards have been shaded.

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Table 2-3
Phase II RFI Groundwater Sample Results - SWMU #1

Constituent	G-123S	G305	G307	G314	G330	G332	G334	FG-1GW	FG-2GW	FG-3GW	FG-4GW	FG-5GW	FG-6GW	FG-7GW	FG-8GW	FG-9GW	FG-10GW	Groundwater Quality Standard[1]
Volatiles GC/MS																		
Benzene	312			1,050	37.6	428		64	10.1		9.87	4,260		2,430			3.1	25
Chlorobenzene						63.3			1.6			963						NS
1,1-Dichloroethane					11.4			273		13.0	4.1							NS
1,1-Dichloroethylene	3.56			3,500	237	2,240		2,450	55.8		46.3	52,300		74,300		46,900	1.4	35
Ethylbenzene	2.8					16						160						1,000
Methylene chloride		15.0				1870		1280	248			15,000		651,000	1,480	199,000		NS
Toluene	59.3		1.3	61	39.1	385			3.1		3.2	5,570					3.4	2,500
1,2-Trans-dichloroethylene					61.9						12.9	218						500
1,1,2-Trichloroethane		6.18										1,800				134,000		50
Trichloroethylene					7.11						3.11	284				1,200		25
Vinyl chloride	33.3			2,250	80.5	441		445	26.1		21.7	1,410		6,050		7,700		10
Acids GC\MS																		
2-Chlorophenol	2.5			18.4	37.5	64.8		40.8		583	31.6	469	14.7		39.3			NS
2,4-Dichlorophenol					53.2			193	73.9	2,000	178	3,430	228			8,820	6.27	NS
2,4-Dimethylphenol					1.1			21.3			6.19	57			5.96			NS
Pentachlorophenol										25.4		260						5
Phenol	1,810			64.1	77.9	2,330		868	126	5,490	577	7,510	1,400	19,900	668	10,100	56.1	100
2,4,6-Trichlorophenol								4.02			1.6	62.7	3.62			79		NS
B/Ns GC/MS																		
Acenaphtene								2.23	4.44	8.82					5.08			NS
Acenaphthylene																		NS
Anthracene						2.52			3.07	17.4								NS
Benzo(a)anthracene									8.0	17.6								NS
Benzo(a)pyrene										15.0								2
Benzo(b)fluoranthene									11.1	18.9								NS
Benzo(ghi)perylene										10.4								NS
bis(2-Ethylhexyl)phthalate															38			NS
Chrysene									9.19	17.1								NS
Di-n-butyl phthalate												3.4						NS
Fluoranthene								1.6	15.3	55.3	2.5				2.5			NS
Fluorene								2.18	4.83	9.8					1.4			NS
Ideno(1,2,3-c,d)pyrene										11.3								NS
Naphthalene	10.6				5.99	25.0		22.4	25.6	66.2	5.68			112	9.92		3.25	NS
Nitrobenzene																1,000		NS
Phenathrene								4.3	24.6	61.7	3.3				2.9			NS

Table 2-3
Phase II RFI Groundwater Sample Results - SWMU #1

Constituent	G-123S	G305	G307	G314	G330	G332	G334	FG-1GW	FG-2GW	FG-3GW	FG-4GW	FG-5GW	FG-6GW	FG-7GW	FG-8GW	FG-9GW	FG-10GW	Groundwater Quality Standard[1]
Pyrene								1.4	11.9	59.8	2.1				2.55			NS
Metals Analysis Data																		
Antimony	14			15						120	16						16	24
Arsenic	7.1	5.4	9.1	97	6.4	3.9	6.9	9.2	11	620	9.0	46	9.4	43	43	6.6	3.4	200
Barium	1,300	54	25	520	41	610	47	49	92	970	79	77	24	390	92	82	270	2,000
Beryllium	0.33								0.53	0.45		0.38		1.4		0.42	0.53	500
Cadmium	0.57																	50
Chromium			3.9					3.9		3.2		12	12	5.3			2.9	1,000
Cobalt		26																1,000
Copper	7.3		2.0				6.7		11	11		9.8	2.7	22		6.8	8.7	650
Lead	7.4		1.2	2.0	1.7					6.3	1.3		4.6	1.1	1.3	1.7	3.4	100
Mercury																0.18		10
Nickel	21			39	7.2	47		13	33	220	7.9	92	200	56	55	92	110	2,000
Selenium	4		33	3.7		4.3	2.0	4.4	5	12	2.4	29	13	18	2.8	8	4.1	50
Silver	2.5						2.8							2.9			2.2	NS
Tin	180						52		43	89				60	23		160	NS
Vanadium			5.8					16	9.9		26	200	280	27	32			NS
Zinc						6.9		13		4.5					8.1	11	14	10,000
Miscellaneous Parameters																		
1,4-Dioxane	130				38	97		89	301	2180	66		10					NS
2,3,4,6-Tetrachlorophenol												19.3						NS
2,4,5-Trichlorophenol						4.2												NS
2,6-Dichlorophenol						239		57.5	18.8	390		527	302		4.4	1,460	6.5	NS
2-Methylnaphthalene								7.7	11	29.1		3.7			1.4			NS
Acetone	196					883		1,500	91		49.9		80,700	16,100			18.4	NS
Acetonitrile	5,640			917	25.5	1,560		902	219					198,000	176	14,800		NS
Acetophenone									5.2						7.8			NS
Aniline	2.8							194							78.3	5,130		NS
Benzyl alchohol											23.1			180				NS
Carbon disulfide	34.7																	NS
Dibenzofuran								1.3	3.5	7.4								NS
Ethyl cyanide	12																	NS
Isobutyl alcholol	33					2,460					28		5.2					NS
Methacrylonitrile											5.0							NS
Methyl ethyl Ketone	43.4																	NS
Methyl-iso-butyl ketone	105				14.1	52					7.5	1,460						NS

Table 2-3
Phase II RFI Groundwater Sample Results - SWMU #1

Constituent	G-123S	G305	G307	G314	G330	G332	G334	FG-1GW	FG-2GW	FG-3GW	FG-4GW	FG-5GW	FG-6GW	FG-7GW	FG-8GW	FG-9GW	FG-10GW	Groundwater Quality Standard[1]
Pyridine	709			35.0	21.5	93.0		365		713	12	3,470		9,300	49.9	8,450		NS
m+p-Cresols	80.5			232	78.8	6.0		248		2,270	122	3,400	31.3	200	123	1,160	6.1	NS
m-Xylene	3.3					23					1.6	260						10,000
o+p-Xylenes	5.8				12.1	23						330						
o-Cresol	6.5			6.5	2.5			4.8			7.2	37.1	5.4					NS
o-Toluidine															33.1			NS
p-Chloroaniline						11.6		103				533			21.2	13,900		NS

NS - No Standard
All results reported in μg/L unless otherwise noted.
[1] Title 35 Illinois Administrative Code, Subtitle F, Subpart D, 620.420 Groundwater Quality Standards for Class II Groundwater.
Concentrations exceeding Groundwater Quality Standards have been shaded.

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Table 2-4A
Phase I RFI Soil Sample Results - SWMU #1

Constituent	B306F1	B306F2	B312F1	B312F2	B313F1	B313F2	B315F1	B315F2	B331F1	B331F2	B333F1	B333F2
Acenaphthene			390		591					19,900	3,970	867
Acenaphthylene											4,790	1,410
Anthracene			605		5,610	250			7,900	55,700	7,330	2,130
Benzene	320	120	2.3	1.9	16	6		10		3,800	573	25.9
Benzo(a)anthracene			1,200	500	2,140	500			15,000	101,000		4,710
Benzo(b)fluoranthene			2,350	800	3,720	470			22,100	80,400		3,200
Benzo(ghi)perylene			990						8,700	51,100		653
Benzo(k)fluoranthene					420	290				14,800		
Benzo(a)pyrene			1,380	450	2,240	390			12,800	83,000		2,780
Bis(2-ethylhexyl)phthalate	460	670	990	370	26,100	1,700	350	700				460
Chlorobenzene					79.5							
Chloroform	140	47			1.3							
Chrysene			1,370	480	2,140				14,400	93,800		2,440
Dibenzo(a,h)anthracene										9,500		430
Di-n-butyl phthalate	4,680	4,640	1,100		1,200	590	1,400	1,300		3,800		
1,2-Dichlorobenzene(o)					490							
1,1-Dichloroethane					1.0	2.9						
1,1-Dichloroethylene	22,500	7,820	3.31	5.11	25.1	144	7.25	8.8	6,650	28,700	31.9	13.6
Di-n-octyl phthalate		940				840		4,290				
Endosulfan I						748						
Endosulfan sulfate						46.1						
Ethylbenzene					15.8						88.8	2.4
Fluoranthene			2,650	1,210	4,240	937			30,600	248,000	9,430	3,970
Fluorene			430		907	250			5,100	27,900	9,210	2,180
Heptachlor						13.8						
Indeno(1,2,3-c,d)pyrene			360						3,500	21,500		460
Methylene chloride	44500	2850	140	220	68.8	174	98.1	205	22300	21000	141	59.1
Naphthalene	160				1,830						20,300	6,740

Table 2-4A
Phase I RFI Soil Sample Results - SWMU #1

Constituent	B306F1	B306F2	B312F1	B312F2	B313F1	B313F2	B315F1	B315F2	B331F1	B331F2	B333F1	B333F2
Phenanthrene			2,880	1,300	5,210	1,190			33,800	226,000	27,100	7,720
Pyrene			2,160	968	3,710	886			22,900	218,000	27,100	4,650
Tetrachloroethylene					13.5							2.1
Toluene	250	140			49	3.8			1,000	2,300	657	23.4
1,2-Trans-dichloroethylene	238	54	2.44		1.4	1.4						
1,1,1-Trichloroethane		49	3.7	2.1								
1,1,2-Trichloroethane	180	110	14.1	10.2	23.6				22,300	12,000		
Trichloroethylene	305	90			6.34							4.21
Trichlorofluoromethane			7.3	5.4								2.1
Vinyl Chloride			16.2	12.5		66.8				15,000		
Ionizable Organics												
2-Chlorophenol						700						
2,4-Dichlorophenol	9,790	910			1,120	490	380					
4-Nitrophenol			1,370									
Phenol	6,050								56,500	18,600	6,090	2,090
Inorganics												
Antimony	4,200	13,000			9,300	8,200	8,500	5,900			18,000	4,800
Arsenic	68,000	7,900	16,000	8,000	6,300	9,200	67,000	18,000	6,400	530	9,900	8,000
Beryllium	2,100	440	680	460	770	630	1,800	1,000	410	410	810	520
Cadmium	1,300						2,100	890	4,000	170	590	190
Chromium	41,000	16,000	19,000	15,000	13,000	19,000	43,000	25,000	14,000	12,000	61,000	16,000
Copper	22,000	16,000	44,000	26,000	32,000	20,000	28,000	16,000	33,000	46,000	51,000	13,000
Lead	22,000	8,000	79,000	17,000	95,000	25,000	33,000	30,000	330,000	360,000	130,000	77,000
Mercury	54	41	180		160	51			390	530	280	71
Nickel	19,000	24,000	32,000	28,000	20,000	25,000	20,000	16,000	13,000	16,000	33,000	13,000
Selenium	4,400	200			1,100		4,200	1,100	240	350	1,700	540
Silver		390	340	290		260	350	270	350	540		

Table 2-4A Phase I RFI Soil Sample Results - SWMU #1												
Constituent	B306F1	B306F2	B312F1	B312F2	B313F1	B313F2	B315F1	B315F2	B331F1	B331F2	B333F1	B333F2
Thallium	3,500	690	610	640	330		3,800	1,100	400		580	340
Zinc	150,000	49,000	110,000	54,000	140,000	58,000	210,000	130,000	170,000	311,000	244,000	99,000

All units reported in $\mu g/kg$ unless otherwise noted.

Table 2-4B
Phase I RFI Soil Sample Results - SWMU #1

Constituent	B339F1	B339F2	B340F1	B340F2	B341F1	B341F2	G305FI	G305F2	G307F1	G307F2	G314F1	G314F2
Acenaphthene	210				3,220	437					396	400
Anthracene	576			1,100	5,810	488	310				755	504
Benzene	0.64	1.3	3.7	60	12,700	250	46		1.9		16	81.5
Benzo(a)anthracene	3,140	880			15,000	1,170	720				1,790	880
Benzo(b)fluoranthene		580		2,600	19,200	1,120	1,100		590		2,710	1,190
Benzo(k)fluoranthene	4,670	733			2,900				330		310	480
Benzo(a)pyrene	2,040	493		1,900	13,000	851	670				1,650	745
Bis(2-ethylhexyl)phthalate						300	900	1,400	3,600	380	2,250	380
Chloroform									1.5		0.74	
Chrysene	1,670	403			16,400	870	770		410			
4,4 DDD					22.3							
Di-n-butyl phthalate		360				280		3,150	3,510	4,830	880	720
1,2-Dichloroethane											5.76	
1,1-Dichloroethylene		2.1	2.5	227				15.3	5.49		4.1	280
Di-n-octyl phthalate									510		3,110	620
Ethylbenzene							70				3	
Fluoranthene	4,130	857		5,060	31,200	1,850	1,530		830		3,610	1,800
Fluorene					3,710	373					428	438
Indeno(1,2,3-c,d)pyrene					3,300							
Methylene chloride	47.9	81.1	30.9	472	81.6	118	478	328	167	126	30.8	414
Naphthalene	423	190	2,870		2,820	599					503	
Phenanthrene	2,450	680	1,800	4,200	22,400	1,920	1,600				3,070	2,170
Pyrene	3,090	671		5,100	28,400	1,560	1,210		837		3,020	1,610
Toluene	2.8	1.8	1.8	180	7.1	94	399		5.3	0.92	7.4	25
1,2 Trans-dichloroethylene							171				1.0	
1,1,2-Trichloroethane	1.8	3						21	17.2	6.68	21.4	384
Trichloroethylene		3.05										
Trichlorofluoromethane	2.6	2.3	1.2					8.8		1.3		

Table 2-4B
Phase I RFI Soil Sample Results - SWMU #1

Constituent	B339F1	B339F2	B340F1	B340F2	B341F1	B341F2	G305F1	G305F2	G307F1	G307F2	G314F1	G314F2
Vinyl Chloride											16.2	76
Ionizable Organics												
2,4-Dichlorophenol						210					837	1,610
Phenol			32,600	7,060								
Inorganics												
Antimony	20,000	19,000	12,000	5,600	21,000	22,000			9,300	6,500	17,000	8,000
Arsenic		13,000	31,000	25,000	27,000	26,000	7,800	3,500	5,900	6,500	8,600	17,000
Beryllium	2,300	2,300	2,000	1,400	2,000	2,000	300	450	160	180	580	170
Cadmium	1,700	1,000	4,300	3,800	4,200	4,000			330			170
Chromium	41,000	37,000	51,000	45,000	58,000	52,000	9,400	16,000	9,500	8,300	79,000	11,000
Copper	26,000	29,000	34,000	32,000	133,000	26,000	26,000	17,000	9,800	11,000	44,000	14,000
Lead	55,000	62,000	41,000	49,000	470,000	360,000	31,000	12,000	29,000	11,000	73,000	36,000
Mercury	140	78	140	130	490	140	84		78	52	40	93
Nickel	22,000	30,000	30,000	18,000	25,000	34,000	18,000	26,000	6,700	12,000	37,000	17,000
Selenium	2,500	1,900	2,600	3,300	2,100	2,800	340		340		300	280
Silver			1,900	3,100							280	
Thallium	2,100	1,800	2,000	2,200	1,500	2,500	520				990	980
Zinc	230,000	19,000	210,000	190,000	493,000	656,000	59,000	48,000	52,000	39,000	190,000	130,000

All units reported in μg/kg unless otherwise noted.

Table 2-4C
Phase I RFI Soil Sample Results - SWMU #1

Constituent	G330F1	G330F2	G332F1	G332F2	G334F1	G334F2	P323F1	P323F2	P329F1	P329F2
Acenaphthene	285	452	1,160				4,330		1,120	520
Acenaphthylene	87	77	600							
Anthracene	1,010	1,530	2,220	664	370		11,100		1,970	854
Benzene	10	115	3.7	746			4.3	2.2	7.9	2.7
Benzo(a)anthracene	3,500	3,580	3,160	1,100			20,000		4,140	1,300
Benzo(b)fluoranthene	2,050	2,010	2,840	1,670			29,100		6,650	2,000
Benzo(ghi)perylene	2,830	2,700	1,660	630					610	
Benzo(k)fluoranthene	1,800	2,050	530				3,150		3,600	
Benzo(a)pyrene	2,780	2,910	2,830	1,070			17,100		1,280	1,140
Bis(2-ethylexyl)phthalate	1,750	3,370	1,700	720		2,130	6,690	650	910	460
Chlorobenzene				336						
Chloroform			1.1				1.1	2	4.5	
Chrysene	3,160	3,180	3,000	1,120			19,200		4,130	1,390
DDD									20	
DDE	29									
Dibenzo(a,h)anthracene									770	
Di-n-butyl phthalate	320	550	1,000	800	800	290	4,530	8,870	2,200	760
1,1-Dichloroethylene	62.2	131	7.83	1060			9.64	7.62	12	5.1
Dieldrin	31.1									
Di-n-octyl phthalate							310		770	
Ethylbenzene		16		130						
Fluoranthene	6,170	6,880	6,830	2,700	1,030		42,300		9,300	3,000
Fluorene	414	606	2,250	635			5,880		1,440	755
Indeno(1,2,3-c,d)pyrene	969	956	710	250					1,300	280
Methylene chloride	144	391	297	1,920	82.4	22.4	240	215	290	149
Naphthalene	1,030	1,110	6,220				3,500		3,740	
Phenanthrene	3,660	6,360	9,540	3,550	420		38,500		9,110	4,000
Pyrene	5,030	5,260	6,470	2,210	1,040		31,400		7,440	2,310

Table 2-4C
Phase I RFI Soil Sample Results - SWMU #1

Constituent	G330F1	G330F2	G332F1	G332F2	G334F1	G334F2	P323F1	P323F2	P329F1	P329F2
Toluene		59	2.5	1,590		1.8	6.9	12.4	4.3	
1,2-Trans-dichloroethylene		18.6								
1,1,2-Trichloroethane			38.6			1.7	9.44	16.3	207	35.4
Trichloroethylene		21.1								
Trichlorofluoromethane		26	5.7		1.8	2.4	2.5			
Vinyl Chloride	430	516	8				15.2			
Ionizable Organics										
2-Chlorophenol	180	210								
2,4-Dichlorophenol		358	2,690	370						
Phenol		160	26,700							
Inorganics										
Antimony	6,000	7,300			5,700	11,000		9,300		
Arsenic	1,200	7,800	5,700	4,400	2,700	6,200	22,000	6,500	11,000	9,200
Beryllium	640	880	830	730	70	360	2,300	160	340	490
Cadmium	1,600	1,800			800		4,300			
Chromium	23,000	56,000	54,000	25,000	5,000	14,000	46,000	5,500	11,000	14,000
Copper	38,000	38,000	56,000	22,000	6,900	16,000	21,000	8,400	42,000	56,000
Lead	130,000	56,000	92,000	53,000	28,000	11,000	46,000	6,000	130,000	220,000
Mercury	140	120			70	73	130		83	98
Nickel	24,000	20,000	30,000	21,000	6,100	21,000	17,000	9,600	25,000	28,000
Selenium	230	240	580	640			6,900	210	270	200
Silver	1,800	1,500		340			320			350
Thallium	670	580	960	680			2,600		560	620
Zinc	110,000	120,000	160,000	270,000	34,000	47,000	260,000	40,000	120,000	230,000

All units reported in μg/kg unless otherwise noted.

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Table 2-5A
Phase II RFI Soil Sample Results - SWMU #1

Constituent	FG-1S	FG-1D	FG-2S	FG-2D	FG-3S	FG-3D	FG-4S	FG-4D	FG-5S	FG-5D
Acenaphthene	1,100	1,020	809	706	672	1,130	843		500	800
Anthracene	2,590	1,780	1,170	1,080	909	1,930	2,550		590	1,900
Benzene				65.9			6.48		847	589
Benzo(a)anthracene	4,200	2,690	1,270	1,680	1,910	3,330	3,660		1,500	8,200
Benzo(b)fluoranthene	3,010	2,150	1,200	1,490	1,860	3,210	2,800	150		6,940
Benzo(ghi)perylene		1,450	821	1,050	1,440	2,150	2,070		980	4,000
Benzo(a)pyrene	3,690	2,370	1,010	1,460	1,680	2,740	3,120		1,400	6,800
Bis(2-ethylhexyl)phthalate		610	380	510	810	690	430	490		
Chlorobenzene				23.9					462	280
Chrysene	4,510	2,970	1,640	1,850	2,120	3,820	3,980		1,800	9,460
Dibenzo(a,h)anthracene										1,100
Di-n-butyl phthalate	2,200	2,960	30,100	3,180	9,620	3,540	2,480	10,200	1,300	1,500
1,1-Dichloroethane	88.1				12.4					
1,1-Dichloroethylene	832	34.7	3.8	352			53.6	9.18	3,370	1,560
Ethylbenzene										
Fluoranthene	9,550	6,060	3,620	3,950	4,430	8,760	8,750	310	3,450	14,200
Fluorene	2,230	1,680	960	905	653	1,760	1,270		700	1,000
Indeno(1,2,3-c,d)pyrene		1,530	766	1,060	1,460	2,250	2,100		930	1,900
Methylene chloride	246	12.7	13.5	1,040					1,480	
Naphthalene	5,150	3,990	1,400	1,160	338	3,590	836	170	700	770
N-Nitrosodiphenylamine				284						
Phenanthrene	13,000	8,570	6,100	4,600	4,270	9,770	7,550	500	3,200	7,800
Pyrene	7,790	5,270	4,070	3,710	4,020	6,820	7,280	292	3,030	12,000
Tetrachloroethylene						2				
Toluene				34.9				3.6	1,440	1,330
1,1,2-Trichloroethane				32.5						
Trichloroethylene							3.2			
Vinyl Chloride	1,400	26.9	62.9	693			138			

Table 2-5A
Phase II RFI Soil Sample Results - SWMU #1

Constituent	FG-1S	FG-1D	FG-2S	FG-2D	FG-3S	FG-3D	FG-4S	FG-4D	FG-5S	FG-5D
Ionizable Organics										
2,4-Dichlorophenol									1,900	2,500
2,4-Dimethylphenol			300							
Phenol		217		469					9,680	12,200
Inorganics										
Antimony				9,400	7,600					
Arsenic	7,600	7,900	76,000	46,000	48,000	24,000	9,600	5,600	30,000	23,000
Beryllium	700	1,100	760	690	640	1,000	760	870	3,100	2,000
Cadmium	1,800	2,900	2,800	2,800	3,100	3,100	2,500	2,300	7,700	5,700
Chromium	18,000	19,000	35,000	16,000	14,000	27,000	20,000	21,000	55,000	45,000
Copper	27,000	29,000	38,000	44,000	55,000	41,000	40,000	26,000	29,000	51,000
Lead	69,000	90,000	75,000	180,000	150,000	100,000	76,000	19,000	120,000	120,000
Mercury	110	190	3,100	1,100	3,800	560	110	71	94	140
Nickel	18,000	17,000	32,000	18,000	23,000	27,000	28,000	30,000	25,000	21,000
Selenium	400	310	520	300	320	300	380	300	2,900	3,100
Silver	420	480	380	690	480	450	500	280	420	400
Thallium	510	410	940	560	740	440	490	400	3,700	2,500
Zinc	98,000	266,000	120,000	190,000	98,000	130,000	120,000	65,000	308,000	262,000

All units reported in $\mu g/kg$ unless otherwise noted.

reports\cleanhbr\cmp\2-5a.tbl

Table 2-5B
Phase II RFI Soil Sample Results - SWMU #1

Constituent	FG-6S	FG-6D	FG-7S	FG-7D	FG-8S	FG-8D	FG-9S	FG-9D	FG-10S	FG-10D
Acenaphthene	100	283	2,850	510	1,180		299	980		754
Acenaphthylene			3,680							
Anthracene	250	899	4,000	1,130	3,360	318	1,520	1,150		1,200
Benzene	10.6	8.36	670	48.8	1,980	116	9,570	2,920		3.6
Benzo(a)anthracene	570	1,610	1,710	1,780	1,540	380	2,770	1,900		1,820
Benzo(b)fluoranthene	852	1,270	1,070	1,630	1,250	260	2,290	1,500		1,550
Benzo(k)fluoranthene		959								
Benzo(ghi)perylene	320	943	1,080	1,110	683		1,900			990
Benzo(a)pyrene	485	1,340	1,350	1,730	977	290	2,670	1,610		1,560
Bis(2-ethylexyl)phthalate	280	220	2,560	440		340	690		280	400
Chlorobenzene						14.4	1,600	670		2.4
Chrysene	708	1,740	2,010	2,050	2,700	473	2,940	1,950		1,940
Di-n-butyl phthalate	2,740	3,650	1,430	1,830	3,210	2,280	9,900	1,800	1,200	16,100
1,2-Dichlorobenzene(o)			160				349			
1,1-Dichloroethane					180					
1,1-Dichloroethylene			580	153	400	68.2	200,000	44,400	4.16	4.2
Ethylbenzene			64				4,100	2,070		
Fluoranthene	1,300	8,310	4,720	3,890	4,540	954	5,590	4,500		4,680
Fluorene	130	445	6,800	813	1,290	210	394	1,390	30	1,200
Indeno(1,2,3-c,d)pyrene		903	1,080	1,060	651		1,760			1,060
Methylene chloride	14.9	13.7	134	1,010	1,360	8.23	69,300	39,900		
Naphthalene	130	352	12,600	2,090	2,360	214	3,610	2,320	100	1,980
Nitrobenzene							865			
Phenanthrene	1,210	3,650	14,900	4,300	8,600	1,100	7,280	6,160	260	5,650
Pyrene	1,040	3,140	6,230	3,180	6,670	932	5,350	3,860	100	4,190
Tetrachloroethylene					86	59.5	6390	2,120		
Toluene			544	39.2	1,220	73	11,900	4,620		6.5
1,1,1-Trichloroethane								220		

Table 2-5B Phase II RFI Soil Sample Results - SWMU #1										
Constituent	**FG-6S**	**FG-6D**	**FG-7S**	**FG-7D**	**FG-8S**	**FG-8D**	**FG-9S**	**FG-9D**	**FG-10S**	**FG-10D**
1,1,2-Trichloroethane			344				225,000	47,600		
Trichloroethylene					266	16.8	10,300	3,340		
Vinyl Chloride			2,670	1,240		55.6				
Ionizable Organics										
2,4-Dichlorophenol	71	68	524		449		62,700			
2,4-Dimethylphenol					270					
Pentachlorophenol					887		774			
Phenol	900	504	11,000	1,750	343		7,290			
2,4,6-Trichlorophenol							668			
Inorganics										
Antimony	3,000									
Arsenic	13,000	17,000	29,000	16,000	193,000	33,000	4,800	6,500	3,200	11,000
Beryllium	3,000	2,600	2,500	620	990	560	2,000	630	1,000	680
Cadmium	4,900	7,100	5,000	2,400	2,600	2,000	2,400	1,600	2,500	1,800
Chromium	29,000	43,000	453,000	13,000	45,000	14,000	41,000	14,000	31,000	15,000
Copper	23,000	34,000	110,000	71,000	90,000	43,000	53,000	20,000	32,000	34,000
Lead	41,000	88,000	390,000	110,000	110,000	190,000	48,000	91,000	38,000	310,000
Mercury	84	180	590	190	190	240	220	220	48	350
Nickel	20,000	23,000	47,000	20,000	34,000	15,000	32,000	11,000	31,000	14,000
Selenium	2,400	2,200	8,200	830	1,200	480	1,300	280		290
Silver	460	680	1,300	600	470		460	460	540	490
Thallium	500	2,400		510	3,200		330	480	750	
Zinc	190,000	240,000	1,410,000	160,000	160,000	210,000	74,000	87,000	79,000	160,000

All results reported in $\mu g/kg$ unless otherwise noted.

reports\cleanhbr\cmp\2-5b.tbl

Table 2-6
Phase II RFI Surface Soil Sample Results - SWMU #1

Constituent	SS-1	SS-2	SS-3	SS-4	SS-14	SS-15	SS-16	SS-17
Anthracene								200
Benzo(a)anthracene	1,700	220	400	500	200		260	1,040
Benzo(b)fluoranthene		250	606	916		250	450	2,450
Benzo(ghi)perylene								792
Benzo(k)fluoranthene			314	386				1,090
Benzo(a)pyrene			305	463			328	1,280
Bis(2-ethylhexyl)phtha		340	280		330	300	330	
Butyl benzyl phthalate					6,830			
Chrysene	1,700	303	524	620	270	220	374	1,230
Di-n-butyl phthalate	3,200	1,680	2,020	4,000	1,100	1,750	2,120	1,810
1,1-Dichloroethylene			18.5			14.3		
Dimethyl phthalate						210		
Fluoranthene	2,910	373	833	804	354	240	489	1,720
Indeno(1,2,3-c,d)pyre								914
Methylene chloride							11	
Naphthalene								150
Phenanthrene	1,900	290	1,330	400	190	120	240	1,010
Pyrene	2,480	351	1,010	769	332	210	425	1,560
Trichloroethylene			2					
Inorganics								
Antimony	1,500	4,000	23,000	7,300	19,000	22,000		2,300
Arsenic	5,900	1,800	2,600	1,600	2,100	1,900	2,100	3,700
Beryllium	1,200	2,000	1,300	1,600	1,300	1,400	1,500	3,400
Cadmium	4,000	13,000	12,000	12,000	12,000	10,000	55,700	3,800
Chromium	110,000	968,000	1,060,000	1,320,000	864,000	1,060,000	600,000	126,000
Copper	43,000	32,000	36,000	52,000	38,000	35,000	78,000	43,000
Lead	120,000	39,000	43,000	32,000	48,000	41,000	68,000	100,000
Mercury	120	110	57	90	120	120		150

All units reported in μg/kg unless otherwise noted.

Table 2-6
Phase II RFI Surface Soil Sample Results - SWMU #1

Constituent	SS-1	SS-2	SS-3	SS-4	SS-14	SS-15	SS-16	SS-17
Nickel	20,000	12,000	26,000	12,000	11,000	140,000	71,000	17,000
Selenium	470		400		260			1,200
Silver	1,200	3,500	3,300	3,000	2,700	3,400	3,700	950
Thallium	330							270
Zinc	251,000	67,000	81,000	67,000	92,000	100,000	110,000	220,000

All units reported in μg/kg unless otherwise noted.

reports\cleanhbr\cmp\2-6.tbl

All units reported in μg/kg unless otherwise noted.

Table 2-7
Phase I RFI Soil Sample Results - SWMU #3

Constituent	B321F1	B321F2	B328F1	B328F2
Acenaphthene	1,150	150	500	260
Alpha-BHC				205
Anthracene	3,310	308	722	320
Benzene	10		2.6	5.04
Benzo(a)anthracene	5,020		1,200	830
Benzo(b)fluoranthene	3,270		1,630	650
Benzo(ghi)perylene	2,200		590	
Benzo(k)fluoranthene	2,830		220	
Benzo(a)pyrene	3,890		1,030	925
Bis(2-ethylhexyl)phthalate	3,340		380	870
Chlorobenzene	9.6			
Chloroform				0.93
Chrysene	4,440		1,100	806
Dibenzo(a,h)anthracene	640			
Di-n-butyl phthalate			580	1,400
1,1-Dichloroethylene			1.4	9.12
Ethylbenzene			1.4	2.1
Fluoranthene	9,940	1,450	2,960	1,430
Fluorene	1,860	180	791	230
Indeno(1,2,3-c,d)pyrene	983		240	230
Methylene chloride	42.5	30.9	49.3	275
Naphthalene	889	180	1,040	
Phenanthrene	10,200	1,280	4,020	1,510
Pyrene	7,630	1,060	2,640	1,460
Toluene	8.6	3.4	3	4.1
1,2-Trans-dichloroethylene				3.02
1,1,1-Trichloroethane			1.2	
1,1,2-Trichloroethane	34.1		4.7	41.9

Table 2-7 Phase I RFI Soil Sample Results - SWMU #3				
Constituent	**B321F1**	**B321F2**	**B328F1**	**B328F2**
Trichloroethylene			3.59	3.97
Trichlorofluoromethane				2.2
Vinyl Chloride				13.9
Ionizable Organics				
2,4-Dichlorophenol	816			
Phenol	3,830			
Inorganics				
Antimony	9,300	9,300		
Arsenic	18,000	9,000	3,700	5,900
Beryllium	430	340	330	350
Chromium	15,000	14,000	14,000	13,000
Copper	27,000	21,000	31,000	30,000
Lead	25,000	14,000	32,000	32,000
Mercury	150	63	78	73
Nickel	25,000	24,000	34,000	31,000
Selenium		240		
Silver			460	280
Thallium	500	580	320	460
Zinc	73,000	53,000	71,000	48,000

All units reported in μg/kg unless otherwise noted.

reports\cleahhbr\cmp\2-7.tbl

Table 2-8 Phase I and II RFI Groundwater Sample Results - SWMU #4					
Constituent	**G303**	**G303**	**G337**	**G337**	**Groundwater Quality Standards[1]**
	Phase I	**Phase II**	**Phase I**	**Phase II**	
Volatiles GC/MS					
Benzene	0.93		0.78		25
Dichlorodifluormethane	526				NS
Ethylbenzene	0.96				1,000
Methylene chloride	8.35		9.37		NS
Acids GC\MS					
Phenol	7.04				100
B/Ns GC/MS					
Acenaphtene	3.14				NS
bis(2-Ethylhexyl)phthalate	11		4.1		NS
Di-n-butyl phthalate	0.78				NS
Fluoranthene	1.2				NS
Fluorene	1.4				NS
Naphthalene	2.78				NS
Phenathrene	2.1				NS
Pyrene	1.0				NS
GW Conventionals					
Chloride (mg/L)	492		476		200
Sulfate as SO4 (mg/L)	54.0		552		400
Metals Analysis Data					
Antimony			58	18	24
Arsenic	15	3.1	56	7.8	200
Barium	570	50	570	70	2,000
Beryllium			4.1		500
Cadmium			11		50
Calcium	89,100		434,000		NS
Chromium	31		150		1,000
Cobalt	22		96		1,000

Table 2-8
Phase I and II RFI Groundwater Sample Results - SWMU #4

Constituent	G303	G303	G337	G337	Groundwater Quality Standards[1]
	Phase I	Phase II	Phase I	Phase II	
Copper	50		240		650
Lead	210	4.4	490	2.0	100
Magnesium	153,000		155,000		NS
Mercury	0.39		0.85	1.2	10
Nickel	26		180		2,000
Potassium	71,000		50,100		NS
Silver			7.5		NS
Sodium	231,000		139,000		NS
Vanadium	33		180		NS
Zinc	410		600		10,000
Miscellaneous Parameters					
Acetone	14.3		53.6		NS
Acetonitrile	391				NS
Dibenzofuran	1.2				NS
Sulfide as S	1.3		1.0		NS
m-Xylene	2.4				10,000
o+p-Xylenes	0.94				

NS - No Standard
All results reported in μg/L unless otherwise noted.
[1] Title 35 IAC 620.420 Groundwater Quality Standards for Class II Groundwater.
Concentrations exceeding Class II Groundwater Quality Standards have been shaded.

reports\cleanhbr\cmp\2-8.tbl

Table 2-9A
Phase I and II RFI Soil Sample Results - SWMU #4

Constituent	B310F1	B310F2	B311F1	B311F2	B320F1	B320F2	B326F1	B326F2	B327F1	B327F2
Acenaphthene	7,780	140	804		522	810	3,270	110	670	261
Anthracene	19,200	288	1,720	170	1,090	1,870	6,150	246	636	543
Benzene	1.9		13,100	6.28	1.7		6.16		6.37	
Benzo(a)anthracene	28,000	740	3,600		2,030	4,100	11,700		1,170	870
Benzo(b)fluoranthene	22,400	643	2,920		1,770	4,280	8,590			928
Benzo(ghi)perylene	14,700	783	1,870			2,340				
Benzo(k)fluoranthene	17,700	455	1,520		1,930	2,260	5,140			507
Benzo(a)pyrene	25,800	691	2,830		2,270	4,040	8,220			733
Bis(2-ethylexyl)phthalate			1,920					2,690		
Chlorobenzene			76,700	8.98			5.1			
Chrysene	27,700	719	3,780		2,180	4,050	10,800		1,310	846
DDD										
DDE										
DDT						1,530				
Dibenzo(a,h)anthracene			690							
1,1-Dichloroethylene							1.6			
Di-n-butyl phthalate										
Ethylbenzene			9,490	1.2						
Fluoranthene	42,400	1,250	4,930	478	4,130	7,280	17,900	598	1,110	1,620
Fluorene	11,200	180	1,190		651	968	4,340	170	961	322
Indeno(1,2,3-c,d)pyrene	5,500	470	800			962				
Methylene chloride	55.4	41.6	5090	23.4	30.5	17.6	46	54.8	62.8	32.8
Naphthalene	10,300	706	1,600	160	864	625	5,540	256	1,670	469
Phenanthrene	82,100	1,290	8,350	761	4,670	7,980	21,100	973	3,770	2,270
Pyrene	30,700	1,040	4,080	363	2,810	5,060	13,200	412	752	1,130
Toluene			12,600	4.6			5			3.4
1,2-Trans-dichloroethylene	27.9									
1,1,1-Trichloroethane										

Table 2-9A
Phase I and II RFI Soil Sample Results - SWMU #4

Constituent	B310F1	B310F2	B311F1	B311F2	B320F1	B320F2	B326F1	B326F2	B327F1	B327F2
1,1,2-Trichloroethane	13.8	16.4		6.92			18.4		10.4	2.6
Trichloroethylene	28.9									
Trichlorofluoromethane	8.7	6.2					2.1			2.2
Vinyl Chloride										
Ionizable Organics										
2,4-Dichlorophenol										
2,4-Dimethylphenol										
Phenol					727	561		1,020	767	503
Inorganics										
Antimony	8,100	11,000	9,600	10,000	5,600	12,000	6,500	5,700	13,000	9,900
Arsenic	8,500	6,800	37,000	27,000	12,000	10,000	7,000	5,400	5,700	6,500
Beryllium	390	500	360	380	570	590	330	270	430	450
Cadmium	660		180		2,100					
Chromium	14,000	18,000	11,000	12,000	18,000	19,000	49,000	11,000	16,000	16,000
Copper	58,000	30,000	129,000	35,000	34,000	37,000	20,000	21,000	30,000	34,000
Lead	190,000	36,000	140,000	75,000	33,000	36,000	90,000	25,000	33,000	100,000
Mercury	440	58	1,100	870	400	130	140	58	120	160
Nickel	24,000	31,000	17,000	22,000	30,000	36,000	10,000	20,000	30,000	24,000
Selenium	160	290	370	450		320	130		140	270
Silver					2,700					
Thallium	270	350		1,200	450	680				510
Zinc	160,000	66,000	110,000	83,000	100,000	120,000	110,000	40,000	60,000	98,000

All units reported in μg/kg unless otherwise noted.

reports\cleanhbr\cmp\2-9a.tbl

Table 2-9B Phase I and II RFI Soil Sample Results - SWMU #4								
Constituent	G303F1	G303F2	G337F1	G337F2	P319F1	P319F2	FG-17S	FG-17D
Acenaphthene	1,800		1,600				1,570	331
Anthracene	7,100					2,300	3,210	525
Benzene		2.5	2.6		1,360	146	877	58.2
Benzo(a)anthracene	18,300	270			240	4,800	6,720	890
Benzo(b)fluoranthene	18,600	180			180	3,500	5,590	878
Benzo(ghi)perylene	9,640				160	2,600	4,660	563
Benzo(k)fluoranthene	8,840	190			230	4,330		
Benzo(a)pyrene	14,400	230			200	4,930	5,600	745
Bis(2-ethylexyl)phthalate							380	240
Chlorobenzene					410	268	140	12
Chrysene	16,800	240	3280		230	5,280	7,570	981
DDD	98	12.5			48.5	36.8		
DDE	62.5							
DDT								
Dibenzo(a,h)anthracene	2,500							
1,1-Dichloroethylene					33.8		4,860	450
Di-n-butyl phthalate							3,690	8,700
Ethylbenzene	1.7				25	37.5		
Fluoranthene	32,900	442	5,120		385	9,480	14,200	2,370
Fluorene			1,200				2,450	463
Indeno(1,2,3-c,d)pyrene	4,000						4,810	548
Methylene chloride	37.0	45.5	29.1	1,060	1,160	136	369	298
Naphthalene			1500		140	1,700	2,300	496
Phenanthrene	21,600	430	6200	180	460	6,100	12,300	2,640
Pyrene	24,500	362	4810		385	7,760	12,600	2,100
Toluene	2	1.2	1.4		421	155	2,360	79.1
1,2-Trans-dichloroethylene								
1,1,1-Trichloroethane	1.3							

Table 2-9B
Phase I and II RFI Soil Sample Results - SWMU #4

Constituent	G303F1	G303F2	G337F1	G337F2	P319F1	P319F2	FG-17S	FG-17D
1,1,2-Trichloroethane								
Trichloroethylene								
Trichlorofluoromethane	1.5		1.5	31	21			
Vinyl Chloride					218			1,440
Ionizable Organics								
2,4-Dichlorophenol							3,560	
2,4-Dimethylphenol							290	
Phenol							9,110	
Inorganics								
Antimony	3,200	6,000	7,400	8,200	7,100	9,000		
Arsenic	4,200	9,600	6,000	7,100	5,600	11,000	4,800	8,500
Beryllium	450	500	640	560	680	570	620	700
Cadmium	1,300	1,600	2,200	1,800	2,000	1,700	1,900	1,800
Chromium	8,100	17,000	16,000	15,000	20,000	22,000	18,000	18,000
Copper	18,000	32,000	36,000	34,000	35,000	40,000	136,000	31,000
Lead	95,000	30,000	120,000	18,000	20,000	470,000	530,000	39,000
Mercury	120	55	190	62	63	160	48	70
Nickel	6,800	27,000	25,000	31,000	32,000	15,000	15,000	31,000
Selenium				150			200	280
Silver	1,700	1,700	2,800	1,900	2,300	1,900	500	610
Thallium		740	450	770	510		450	400
Zinc	69,000	89,000	150,000	52,000	65,000	250,000	277,000	59,000

All units reported in μg/kg unless otherwise noted.

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Table 2-10
Phase II RFI Surface Soil Sample Results - SWMU #4

Constituent	SS-5	SS-20	SS-21
Anthracene	190		
Benzo(a)anthracene	1,020		
Benzo(b)fluoranthene	1,240		
Benzo(k)fluoranthene	762		
Benzo(a)pyrene	998		
Bis(2-ethylexyl)phthalate	300		
Chrysene	1,250		
Di-n-butyl phthalate	1,530	1,300	
Fluoranthene	1,960		2,400
Hexachlorobenzene	275		
Indeno(1,2,3-c,d)pyrene	529		
Phenanthrene	1,020		1,900
Pyrene	2,010		2,300
Inorganics			
Antimony	22,000	2,300	1,600
Arsenic	2,500	4,400	1,100
Beryllium	1,300	360	270
Cadmium	12,000	1,500	540
Chromium	740,000	8,900	29,000
Copper	44,000	15,000	16,000
Lead	92,000	11,000	45,000
Mercury	110		250
Nickel	14,000	15,000	7,500
Selenium			130
Silver	2,400	270	270
Zinc	110,000	40,000	82,000

All units reported in μg/kg unless otherwise noted.

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Table 2-11 Phase I and II RFI Groundwater Sample Results - SWMU #5							
Constituent	G302	G302	G318	G318	G336	G336	Groundwater Quality Standard[1]
	Phase I	Phase II	Phase I	Phase II	Phase I	Phase II	
Volatiles GC/MS							
Benzene	80.4	40.9	0.31		111	69.0	25
Chlorobenzene	26.1	15.2			12.4	8.11	NS
Methylene chloride	9.71		8.32		18.0		NS
Toluene	39.0						2,500
Acids GC\MS							
2-Chlorophenol	5.08				0.64		NS
2,4-Dichlorophenol	21.5						NS
Phenol	24.5						100
B/Ns GC/MS							
Acenaphthene					1.7		NS
Acenaphthylene						2.53	NS
bis(2-Ethylhexyl)phthalate			3.3		12.4		NS
Di-n-butyl phthalate					0.37		NS
Fluorene					0.48		NS
Naphthalene	2.36				0.53		NS
Phenathrene					0.43		NS
GW Conventionals							
Chloride (mg/L)	531		294		593		200
Sulfate as SO4 (mg/L)	194		195		340		400
Metals Analysis Data							
Antimony	99		50				24
Arsenic	150		78	19	68	3.2	200
Barium	1200	74	510	63	720	86	2,000
Beryllium	15		3.7		4.9		500
Cadmium	60		10		38	0.96	50
Calcium	3,990,000		404,000		688,000		NS
Chromium	370		140		110	2.3	1,000

Table 2-11 Phase I and II RFI Groundwater Sample Results - SWMU #5							
Constituent	G302	G302	G318	G318	G336	G336	Groundwater Quality Standard[1]
	Phase I	Phase II	Phase I	Phase II	Phase I	Phase II	
Cobalt	90	NA	91	NA	47		1,000
Copper	510	NA	160	NA	520	4.2	650
Iron		NA		NA			5,000
Lead	2,400		350		1,100		100
Magnesium	1,560,000		180,000		407,000		NS
Mercury	0.33		0.39		0.70		10
Nickel	270	5.3	160	4.5	140	8.2	2,000
Potassium	104,000		36,000		153,000		NS
Selenium	9.3	1.3			5.6	1.1	50
Silver	46		5.8		18	3.2	NS
Sodium	208,000		82,400		286,000		NS
Tin					24	190	NS
Vanadium	340		160		190		NS
Zinc	2,000		390		1,300	5	10,000
Miscellaneous Parameters							
Acetone	47.1		10.2		9.7		NS
Sulfide as S (mg/L)			0.62		5.7		NS
p-Chloroaniline					0.64		NS

NS - No Standard
All units reported in $\mu g/L$ unless otherwise noted.
[1] Title 35 Illinois Administrative Code, Subtitle F, Subpart D, 620.420 Groundwater Quality Standards for Class II Groundwater.
Concentrations exceeding Groundwater Quality Standards have been shaded.

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Table 2-12 Phase I RFI Soil Sample Results - SWMU #5				
Constituent	G318F1	G318F2	G336F1	G336F2
Acenaphthene		482		
Anthracene		604		
Benzene	4.54	1.3	44.1	8.31
Benzo(a)anthracene		1,120		
Benzo(b)fluoranthene		962		
Benzo(ghi)perylene		826		
Benzo(k)fluoranthene		904		
Benzo(a)pyrene		1,200		
Bis(2-Ethylhexyl)phthalate	2,860			
Chlorobenzene	1.9		20.6	
Chrysene		1,060		
1,2-Dichloroethane	5.35			
1,1-Dichloroethylene	11.4			
Ethylbenzene	1.7			
Fluoranthene		2,020	2,600	
Fluorene		686		
Indeno(1,2,3-c,d)pyrene		330		
Methylene chloride	52.6	28.6	29.3	12.3
Naphthalene		1,190		
Phenanthrene		2,930	2,800	
Pyrene		1,560	2,200	
Toluene	10.3	3.3	7.6	
1,1,2-Trichloroethane	12.4			
Trichloroethylene	1.9	3.84		
Trichlorofluoromethane	5			
Inorganics				
Antimony	7,300	7,300	5,300	7,400
Arsenic	5,200	11,000	10,000	4,200

Table 2-12
Phase I RFI Soil Sample Results - SWMU #5

Constituent	G318F1	G318F2	G336F1	G336F2
Beryllium	510	640	390	430
Cadmium	1,500	2,000	3,000	2,800
Copper	21,000	29,000	36,000	34,000
Chromium	41,000	23,000	8,400	10,000
Lead	11,000	95,000	310,000	38,000
Mercury	51	140	140	53
Nickel	23,000	27,000	6,900	13,000
Selenium			260	
Silver	2,000	2,700	3,700	3,500
Thallium		450		
Zinc	50,000	74,000	85,000	60,000

All units reported in μg/kg unless otherwise noted

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Table 2-13
Phase II RFI Surface Soil Sample Results - SWMU #5

Constituent	SS-6	SS-10	SS-22	SS-23
Benzo(a)anthracene				2,600
Bis(2-ethylexyl)phthalate			404,000	
Chlorobenzene				3.5
Chrysene	2,400			3,000
Di-n-butyl phthalate				3,300
Fluoranthene	4,120	1,700	5,070	6,070
Hexachlorobenzene		3,100		
Phenanthrene	3,200			6,100
Pyrene	3,410	2,100	4,000	5,180
Toluene				3.3
Trichlorofluoromethane		3.6		
Inorganics				
Antimony	9,500		90,000	4,800
Arsenic	7,200	5,400	4,300	9,600
Beryllium	1,500	1,900	690	2,000
Cadmium	4,700	1,700	5,000	4,300
Chromium	184,000	27,000	157,000	57,000
Copper	49,000	23,000	32,000	32,000
Lead	260,000	44,000	1,260,000	270,000
Mercury	150	110	130	230
Nickel	24,000	17,000	11,000	13,000
Selenium	440	300		560
Silver	920	560		610
Thallium	290	330		
Zinc	481,000	81,000	1,570,000	744,000

All units reported in $\mu g/kg$ unless otherwise noted.

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Table 2-14
Phase I and II RFI Vault Leachate Results - SWMU #5

Constituent	V-1	L-1	L-2	L-3	L-4
Volatiles GC/MS					
Benzene	1,750	2,860	10,700	94.9	2,990
Chlorobenzene	1,050	1,440	7,170	18.8	1,510
1,1-Dichloroethane	190			233	
1,2-Dichloroethane	743				
1,1-Dichloroethylene	5,790			183	10,900
Ethylbenzene	630	171			
Methylene chloride	4,390	1,010	1,280	512	22,300
Toluene	6,210	1,580	7,310	85.5	17,500
1,1,2-Trichloroethane	2,980				36,700
Trichloroethylene					314
Vinyl chloride	3,640	1,780			8,130
Acids GC\MS					
2-Chlorophenol		812	195	824	9,260
2,4-Dichlorophenol		6,160	1,070	4,320	41,200
2,4-Dimethylphenol			114	144	
Phenol			5,520	10,600	131,000
2,4,6-Trichlorophenol				92.6	695
B/Ns GC/MS					
Acenapthene			59.5	39.4	
Acenaphthylene					27.5
Anthracene			126	34.1	
Benzo(a)anthracene			158	58.2	
Benzo(a)pyrene			109	39.5	
Benzo(b)fluoranthene			169	73.1	
Benzo(ghi)perylene			56.4		
Bis(2-Ethylhexyl)phthalate				250	
Chrysene			183	47.7	
Fluoranthene			392	125	
Fluorene			175	54.4	
Hexachlorobenzene			195	212	

Table 2-14
Phase I and II RFI Vault Leachate Results - SWMU #5

Constituent	V-1	L-1	L-2	L-3	L-4
Ideno(1,2,3-c,d)pyrene			53.4		
Naphthalene			405	139	688
Pentachlorobenzene				28.5	
Phenathrene		25.4	680	184	22
Pyrene			400	132	
Pest/PCBs GC/MS					
Gamma-BHC		7.17			0.439
Delta-BHC		1.38			
4,4'-DDT		0.539			0.201
Endrin aldehyde		0.365			
Kepone		1.38			
GW Conventionals					
Cynaide, Total (mg/L)		0.0644	0.0947	0.127	33.6
Metals Analysis Data					
Antimony		150	21		
Arsenic		110	26	220	180
Barium		2,000	470	520	1100
Beryllium		9.1	3.1	2.5	15
Cadmium		60	4.5	4.8	42
Chromium		4,270	220	200	2,900
Cobalt		240	34	89	130
Copper		3,180	29	310	1,280
Lead		8,170	170	260	2,200
Mercury		2.5		0.40	1.20
Nickel		1,100	580	2,160	1,200
Selenium			33	300	140
Silver			6.4		4.6
Thallium					6.4
Tin			480		1,300
Vanadium		190	49	370	260
Zinc		38,300	1,700	2,800	10,700

Table 2-14 Phase I and II RFI Vault Leachate Results - SWMU #5					
Constituent	V-1	L-1	L-2	L-3	L-4
Miscellaneous Parameters					
1,4-Dioxane			1,990	316	
2,3,7,8-TCDD (ppt)		13.8			
2,3,7,8-TCDF (ppt)		2.6		0.33	
2,6-Dichlorophenol					5,760
2-Methylnaphthalene		41.9	430	90.9	157
Acetone	8,480				
Acetonitrile		93.3	197	130	
Aniline		296			2,000
Disulfoton					2.89
HxCDD (ppt)		4.9		0.51	
Isobutyl alcholol	26.8	2,060		656	120,000
Methyl-iso-butyl ketone	2,760			273	
PCDD (ppt)		0.77		0.75	
PCDF (ppt)		5.3		0.43	
Phorate					204
Pyridine			175		2,610
TCDD (ppt)		95.3		1.7	11.6
TCDF (ppt)		28.0		1.8	
o-Cresol				4,150	
m+p-Cresols		10,200	2,570		24,600
m-Xylene	990	128		52	
o+p-Xylenes	800	121		48.5	
p-Chloroaniline		998	214	8,500	8,500

All results reported in μg/L unless otherwise noted.

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Table 2-15 Phase I and II RFI Groundwater Sample Results - SWMU #6								
Constituent	**G308**	**G308**	**G317**	**G317**	**G324**	**G324**	**FG-15GW**	**Groundwater Quality Standard[1]**
	Phase I	**Phase II**	**Phase I**	**Phase II**	**Phase I**	**Phase II**	**Phase II**	
Volatiles GC/MS								
Benzene	11.9	34.2	31.2	11.3	71.9	18.3	482	25
Chlorobenzene				6.64	15.9	27.3		NS
1,1-Dichloroethane	5.18	7.71		4.6	15.4			NS
1,2-Dichloroethane	7.98	9.79			47.7			25
1,1-Dichloroethylene		2.7	32.8	34.8			2,430	35
Methylene chloride	50.0	9.56	97.2	33.1	43.7		764	NS
Toluene	4.9	27.9	20	12.3	25.1	6.53	2,820	2,500
Vinyl chloride	27.8				46.7			10
Acids GC\MS								
2-Chlorophenol	50.4	73.8		5.21	34	5.20	8.21	NS
2,4-Dichlorophenol	283	1,280	313	340	37		458	NS
2,4-Dimethylphenol	21.9	77.9			40			NS
Phenol	236	553	378	183	715	59.5	90	100
2,4,6-Trichlorophenol	2.7	26.2					35.6	NS
B/Ns GC/MS								
Acenaphtene	8.37	14.4		2.22		4.64		NS
Anthracene	2.26							NS
Benzo(a)anthracene	1.6							NS
Benzo(b)fluoranthene	1.4							NS
bis(2-Ethylhexyl)phthalate	5.7							NS
1,2-Dichlorobenzene							6.64	NS
Di-n-butyl phthalate	0.33			52.7				NS
Di-n-octyl phthalate	0.64							NS
Fluoranthene	5.66	6.23						NS
Fluorene	4.57	9.78	3.72	1.8		2.80		NS
Hexachlorobenzene							10.3	NS

Table 2-15 Phase I and II RFI Groundwater Sample Results - SWMU #6								
Constituent	G308	G308	G317	G317	G324	G324	FG-15GW	Groundwater Quality Standard[1]
	Phase I	Phase II	Phase I	Phase II	Phase I	Phase II	Phase II	
Naphthalene	31.8	85.6	24.0	9.22	46.5	16.7	46.3	NS
Phenathrene	12.8	22.9	9.12	3.4		4.8		NS
Pyrene	4.46	4	2.64					NS
GW Conventionals								
Chloride (mg/L)	417		219		1,124			200
Sulfate as SO4 (mg/L)	185		25.8		510			400
Cynaide, Total (mg/L)					0.0374			
Metals Analysis Data								
Antimony			24	13				24
Arsenic	170	130	17	2.0	47	6.3	2.0	200
Barium	1,500	41	2,010	1700	1,600	58	420	2,000
Beryllium	8.9		1.1	0.40	4.4			500
Cadmium	56		4.6		17			50
Calcium	911,000		1,150,000		647,000			NS
Chromium	220		170		120			1,000
Cobalt	110		14		49			1,000
Copper	590		200	9.8	290		8.5	650
Iron					79,500			5,000
Lead	1,900	2.2	830	1.9	3,700		2	100
Magnesium	400,000		46,600		190,000			NS
Mercury	2.0		1.0		1.7	0.3		10
Nickel	660	30	110	31	230	18	48	2,000
Potassium	119,000		125,000		176,000			NS
Selenium	1.9	1.0			5.3	2.4	9	50
Silver	23		7.7		11			NS
Sodium	292,000		122,000		606,000			NS
Thallium	4.6							NS

Table 2-15 Phase I and II RFI Groundwater Sample Results - SWMU #6								
Constituent	**G308**	**G308**	**G317**	**G317**	**G324**	**G324**	**FG-15GW**	**Groundwater Quality Standard[1]**
	Phase I	**Phase II**	**Phase I**	**Phase II**	**Phase I**	**Phase II**	**Phase II**	
Tin			27	21				NS
Vanadium	320	4.0	170		160	18		NS
Zinc	1,900	4.1	1,000	10	2,050			10,000
Miscellaneous Parameters								
1,4-Dioxane	39.3							NS
2,4,5-Trichlorophenol								NS
2,6-Dichlorophenol	14.4		53.1					NS
2-Methylnaphthalene				2.6		3.5	12.7	NS
2-Naphthylamine				2.6			12.7	NS
Acetone	88.4		675	398				NS
Acetonitrile	17.7		110	6.0	74.6		140	NS
Acetophenone				12.6		2.9	11.8	NS
Aniline	6.6	46.7						NS
Aramite								NS
Benzyl alchohol	1.2							NS
Carbon disulfide		15.1						NS
Dibenzofuran	3.5	6.96						NS
Dimethoate		6.4						NS
Methyl ethyl ketone	18.8			45.0				NS
Methyl parathion								NS
Methyl-iso-butyl ketone	18.6				11			NS
Pentochlorobenzene							2.6	NS
Pyridine	0.72					1.3		NS
Sulfide as S (mg/L)	17.3		2.7		16.1			NS
m+p-Cresols	188	452	68.8	26.3	221		13.5	NS
m-Xylene					4.5			NS
o+p-Xylenes				2.3	4.1			NS

Table 2-15 Phase I and II RFI Groundwater Sample Results - SWMU #6								
Constituent	**G308**	**G308**	**G317**	**G317**	**G324**	**G324**	**FG-15GW**	**Groundwater Quality Standard[1]**
	Phase I	**Phase II**	**Phase I**	**Phase II**	**Phase I**	**Phase II**	**Phase II**	
o-Cresol	11.8	18.1	5.7		35	3.4		NS
p-Chloroaniline	24.6	617						NS

NS - No Standard
All results reported in μg/L unless otherwise noted.
[1] Title 35 IAC 620.420 Groundwater Quality Standards for Class II Groundwater.
Concentrations exceeding Class II Groundwater Quality Standards have been shaded.

reports\cleanhbr\cmp\2-15.tbl

Table 2-16A Phase I and II RFI Soil Sample Results - SWMU #6								
Constituent	B301F1	B301F2	B309F1	B309F2	B325F1	B325F2	B335F1	B335F2
Acenaphthene			473		1,400	327	10,000	
Anthracene		140	678		3,670	771	31,600	
Benzene	27	7.19	7,240	14.1	5.63	5.33	4.54	4.7
Benzo(a)anthracene	1,800	310	1,790			1,500	12,400	5,474
Benzo(b)fluoranthene	2,100	220	2,440			1,110		
Benzo(ghi)perylene			1,270			849	19,200	
Benzo(k)fluoranthene		210	1,060			887	61,000	
Benzo(a)pyrene	1,800	220	1,510			1,280	35,000	
bis(2-Ethylhexyl)phthalate		11,100						
Chlorobenzene	61.5		543					
Chloroform			801					
Chrysene	1,700	318	1,990			1,440	49,000	
DDD	55.9							
DDE	60.9							
Di-n-butyl phthalate		980						
1,2-Dichlorobenzene(o)			794					
1,4-Dichlorobenzene(p)			150					
1,1-Dichloroethane			170					
1,2-Dichloroethane			1,140		4.59			
1,1-Dichloroethylene			36,900	14.1	3.27	3.6		
Ethylbenzene			329					
Fluoranthene	4,150	577	2,160		12,500	2,470	117,000	9,950
Fluorene		130	692		1,400	551	19,000	
Hexachlorobenzene			11,200					
Indeno(1,2,3-c,d)pyrene			440			340	7,510	
Isophorone			130					
Methylene chloride	734	948	31,600	154	63.9	70.8	54.0	149

Table 2-16A Phase I and II RFI Soil Sample Results - SWMU #6								
Constituent	B301F1	B301F2	B309F1	B309F2	B325F1	B325F2	B335F1	B335F2
Naphthalene		160	2,320		1,100	535	16,000	
Phenanthrene	4,100	610	4,040	120	14,500	3,730	155,000	6,315
Pyrene	3,280	416	1,990		9,210	1,900	88,600	7,240
Tetrachloroethylene			103					
Toluene	53	3.7	77,800	2.4	6.63		2.6	
1,2-Trans-dichloroethylene			167					
1,1,1-Trichloroethane			192					
1,1,2-Trichloroethane			109,000		44.3	15.2	4.2	12.0
Trichloroethylene			195					
Trichlorofluoromethane					7.3			
Vinyl Chloride			939					
Ionizable Organics								
2,4-Dichlorophenol			25,000					
Phenol			8,630			669		
2,4,6-Trichlorophenol			1,300					
Inorganics								
Antimony	4,400	17,000	15,000	13,000	11,000	7,800		
Arsenic	3,600	10,000	1,200	7,100	5,500	5,800	24,000	20,000
Beryllium	700	590	400	480	690	510	810	600
Cadmium	2,900				260		2,100	960
Chromium	14,000	17,000	180,000	18,000	50,000	32,000	17,000	18,000
Copper	24,000	32,000	28,000	28,000	42,000	82,000	74,000	53,000
Lead	220,000	48,000	86,000	13,000	280,000	76,000	500,000	180,000
Mercury	120	110	100	58	230	60	370	240
Nickel	12,000	25,000	23,000	29,000	21,000	28,000	21,000	16,000
Selenium			400	190	210			
Silver	3,500	280	1,100	260			2,400	1,600

Table 2-16A Phase I and II RFI Soil Sample Results - SWMU #6								
Constituent	B301F1	B301F2	B309F1	B309F2	B325F1	B325F2	B335F1	B335F2
Thallium				620			2,100	1,500
Zinc	352,000	85,000	160,000	53,000	268,000	230,000	371,000	150,000

All units reported in $\mu g/kg$ unless otherwise noted.

reports\cleanhbr\cmp\2-16a.tbl

Table 2-16B
Phase I and II RFI Soil Sample Results - SWMU #6

Constituent	G308F1	G308F2	G317F1	G317F2	G324F1	G324F2	G324AF1	G324AF2	G316F1	P316F2
Acenaphthene	4,820	3,030					18,900	835		
Alpha-BHC										301
Anthracene	10,200	5,880				2,830	26,400	1,410		
Benzene	1.5	2.2		7.48	5.19		1.9	1.8	13.1	15.5
Benzo(a)anthracene	27,600	7,000					42,000	3,190		
Benzo(b)fluoranthene		4,300					28,400	2,950		
Benzo(ghi)perylene	14,100	3,500					17,300	1,260		
Benzo(k)fluoranthene	42,900						3,255	258		
Benzo(a)pyrene	22,700	5,200					27,600	2,040		
Chlorobenzene					6.21					22.6
Chrysene	28,700	7,470				4,690	38,500	3,280		
Dibenz(a,h)anthracene					4,680					
DDD										
DDE										
Di-n-butyl phthalate										
1,2-Dichlorobenzene(o)										
1,4-Dichlorobenzene(p)										
1,1-Dichloroethane										3.1
1,2-Dichloroethane										1.7
1,1-Dichloroethylene				6.2						
Ethylbenzene				3.5					47.2	9.7
Fluoranthene	72,100	30,200			9,940	10,200	103,000	10,900		
Fluorene	5,230	3,620					16,400	967		
Indeno(1,2,3-c,d)pyrene	5,100						6,740	500		
Isophorone										
Methylene chloride	19.4	21.7	9.49	16.5		17.3	22.7	36.9	40.2	23.3
Naphthalene	2,650	4,420					8,500	2,500		
Phenanthrene	51,200	26,700		198	7,320	10,900	103,000	5,560		

Table 2-16B Phase I and II RFI Soil Sample Results - SWMU #6										
Constituent	G308F1	G308F2	G317F1	G317F2	G324F1	G324F2	G324AF1	G324AF2	G316F1	P316F2
Pyrene	54,700	23,600			7,710	8,610	83,000	8,830		
Tetrachloroethylene									26.7	
Toluene			3.1	13.6					116	15.5
1,2-Trans-dichloroethylene							1.6	2.75		
1,1,1-Trichloroethane										
1,1,2-Trichloroethane										
Trichloroethylene										
Trichlorofluoromethane										
Vinyl Chloride										
Ionizable Organics										
2,4-Dichlorophenol										
Phenol										
Inorganics										
Antimony				45,000	11,000	8,700			10,000	
Arsenic	9,100	9,700	1,000	2,400	4,100	19,000	12,000	14,000	1,500	4,400
Beryllium	650	850		220	560	470	750	840	490	810
Cadmium	3,000	4,600	34,500	7,700	2,500	3,900	4,300	5,000	1,300	1,700
Chromium	14,000	20,000	140,000	1,110,000	18,000	179,000	72,000	19,000	552,000	31,000
Copper	63,000	49,000	46,000	47,000	58,000	25,000	48,000	45,000	25,000	42,000
Lead	130,000	100,000	35,000	72,000	180,000	290,000	190,000	39,000	12,000	160,000
Mercury	250	140		150	300	180	240	130		290
Nickel	34,000	29,000	7,200	14,000	2,100	8,400	27,000	36,000	9,000	16,000
Selenium		390								
Silver	2,000	1,700	10,000	9,500	2,000	4,800	1,400	1,800	4,700	2,400
Thallium		590						1,300		
Zinc	130,000	110,000	41,000	99,000	180,000	120,000	160,000	76,000	15,000	220,000

All units reported in $\mu g/kg$ unless otherwise noted.
reports\cleanhbr\cmp\2-16b.tbl

Table 2-17 Phase II RFI Surface Soil Sample Results - SWMU #6					
Constituent	**SS-7**	**SS-8**	**SS-9**	**SS-18**	**SS-19**
Bis(2-ethylexyl)phthalate					
Chrysene		5,700			4,100
Fluoranthene		9,380	5,320		7,870
Methylene chloride					4.0
Pyrene		7,750	4,520		6,570
Inorganics					
Antimony				9,100	
Arsenic	30,000	5,100	15,000	22,000	18,000
Beryllium	990	710	850	2,000	860
Cadmium	4,200	2,500	3,400	12,000	3,300
Chromium (6+)	92,000	34,000	44,000	803,000	42,000
Copper	60,000	34,000	67,000	44,000	54,000
Lead	200,000	120,000	140,000	66,000	290,000
Mercury		160	230	440	540
Nickel	32,000	19,000	33,000	13,000	26,000
Silver				2,300	
Zinc	220,000	150,000	514,000	130,000	293,000

All units reported in μg/kg unless otherwise noted.

reports\cleanhbr\cmp\2-17.tbl

Table 2-18 Phase I RFI Groundwater Sample Results - SWMU #10						
Constituent	G343	G344	G347	G348	G349	Groundwater Quality Standard[1]
Volatiles GC/MS						
Benzene		212		83	41.3	25
Chlorobenzene					16	NS
1,1-Dichloroethane					30.9	NS
1,2-Dichloroethane		80.5			19.4	25
1,1-Dichloroethylene		28.1				35
Ethylbenzene		90.0		130	66.5	NS
Methylene chloride	6.58	60.5	8.14	481	41.0	NS
Tetrachloroethylene					128	25
Toluene		418		280	353	2,500
1,2-Trans-dichloroethylene					15.8	500
Trichloroethylene					17.9	25
Vinyl chloride				954		10
Acids GC\MS						
2-Chlorophenol		989		2730	30.2	NS
2,4-Dichlorophenol		1,310		186	94.4	NS
2,4-Dimethylphenol		31.6		15	3.75	NS
Pentachlorophenol		13.3				5
Phenol		4,290		231	350	100
2,4,6-Trichlorophenol		3.60			3.79	NS
B/Ns GC/MS						
Acenaphtene		3.51				NS
bis(2-Ethylhexyl)phthalate		11.5	12.7			NS
Di-n-butyl phthalate			0.55		0.74	NS
Fluorene		2.47				NS
Isophorone				11	0.49	NS
Naphthalene		98.7		42.14	7.81	NS
Phenathrene		1.6				NS

Table 2-18 Phase I RFI Groundwater Sample Results - SWMU #10						
Constituent	**G343**	**G344**	**G347**	**G348**	**G349**	**Groundwater Quality Standard[1]**
GW Conventionals						
Chloride (mg/L)	23.8	1,320	212	1,024	549	200
Sulfate as SO4 (mg/L)	243	835	210	154	390	400
Metals Analysis Data						
Arsenic	18	130	30	65.0	190	200
Barium	130	370	330	880	710	2,000
Beryllium	0.29	12	1.9	9.4	23	500
Cadmium	0.80	18	11	22	56	50
Calcium	127,000	491,000	368,000	227,000	524,000	NS
Chromium	15	190	47	140	380	1,000
Cobalt	6.4	31	30	28	69	1,000
Copper	22	100	86	130	220	650
Iron				72,700		5,000
Lead	110	180	470	840	270	100
Magnesium	44,000	34,600	185,000	123,000	58,300	NS
Mercury	0.17			0.69	0.20	10
Nickel	14	130	52	90	210	2,000
Potassium	16,000	419,000	28,000	439,000	278,000	NS
Selenium		19	1.1	8.7	29	50
Silver		8.1	5.8		8.5	NS
Sodium	22,000	593,000	117,000	346,000	352,000	NS
Thallium		8.4		2.8	20	20
Tin				15		NS
Vanadium	27	360	89	230	690	NS
Zinc	95	1,100	370	1,300	2,230	10,000
Miscellaneous Parameters						
1,4-Dioxane			82.7			NS
2,3,4,6-Tetrachlorophenol		4.6				NS
2,4,5-Trichlorophenol		29.0				NS

Table 2-18 Phase I RFI Groundwater Sample Results - SWMU #10						
Constituent	G343	G344	G347	G348	G349	Groundwater Quality Standard[1]
2,6-Dichlorophenol		134			13.4	NS
2-Methylnaphthalene				8.8		NS
2-Picoline		3.4				NS
Acetone	20.3	1,100	23.7	586	376	NS
Acetonitrile		13.4	8.97	362		NS
Acetophenone		11.5			2.6	NS
Aniline		1,070		3,250		NS
Dibenzofuran		2.3				NS
Ethyl cyanide			14.1			NS
Isobutyl alcholol			21.2			NS
Methacrylonitrile			4.5			NS
Methyl ethyl ketone						
Methyl-iso-butyl ketone		2,310	5.1	2,300	171	NS
Phorate				3.01		NS
Pyridine		7.1				NS
Styrene					239	500
Sulfide as S (mg/l)		18.6	0.30	2.3	0.40	NS
m+p-Cresols		514		233	42.8	NS
m-Xylene		219		320	205	10,000
o+p-Xylenes		179		220	188	
o-Cresol		86.4			13.1	NS
o-Toluidine		232		283		NS
p-Chloroaniline		5,570		6,350		NS

NS - No Standard
All results reported in μg/L unless otherwise noted.
[1] Title 35 IAC 620.420 Groundwater Quality Standards for Class II Groundwater.
Concentrations exceeding Class II Groundwater Quality Standards have been shaded.

reports\cleanhbr\cmp\2-18.tbl

Table 2-19
Phase II RFI Groundwater Sample Results - SWMU #10

Constituent	FG-11GW	FG-12GW	FG-13GW	FG-14GW	G343	G344	G347	G348	G349	Groundwater Quality Standard[1]
Volatiles GC/MS										
Benzene		122	115	14,200		137		119	132	25
Chlorobenzene		21.0	57	701						NS
Chloroform				4,480						NS
1,1-Dichloroethane				3,560						NS
1,2-Dichloroethane		58.2		6,250				66.2		25
1,1-Dichloroethylene			97.8	39,800				43.4		35
Ethylbenzene		134	158	13,400		72		41.7	800	NS
Methylene chloride	478	27.3		8,360						NS
1,1,2,2-Tetrachloroethane										NS
Tetrachloroethylene				2,650					326	25
Toluene		479	1,470	85,200		288		108	1,500	2,500
1,2-Trans-dichloroethylene				251						500
1,1,1 Trichloroethane			23					18		NS
1,1,1-Trichloroethylene				67,400						NS
1,1,2-Trichloroethane			23	28,600				40.8		50
Trichloroethylene				2,220						25
Vinyl chloride								32.5		10
Acids GC\MS										
2-Chlorophenol		247	1,210	11,100	8.52	541		1,590	52.1	NS
2,4-Dichlorophenol		1,160	31,400	62,600	20.4	345		635	294	NS
2,4-Dimethylphenol		41.2		7,250	4.96					NS
4,6-Dinitro-o-cresol					4.5					NS
2-Nitrophenol					8.12					NS
p-Chloro-m-cresol					6.23					NS
Pentachlorophenol			61	675	9.06	7.12				5
Phenol		5,120	403	16,800		3,570		25.1	547	100
2,4,6-Trichlorophenol		44.4	358	878	8.97	28.3		14.5	6.50	NS

Table 2-19
Phase II RFI Groundwater Sample Results - SWMU #10

Constituent	FG-11GW	FG-12GW	FG-13GW	FG-14GW	G343	G344	G347	G348	G349	Groundwater Quality Standard[1]
B/Ns GC/MS										
Acenaphtene						4.98				NS
1,2-Dichlorobenzene			6.16	4,970				3.32		NS
1,3-Dichlorobenzene				432						NS
1,4-Dichlorobenzene				559						NS
Fluorene						4.85				NS
Naphthalene		41.8				74.8		25.0	62.1	NS
Nitrobenzene			569	7,980						NS
Phenathrene				43		2.8				NS
Metals Analysis Data										
Arsenic		31	3.7	18	2.6	27	6.4	7.5	15	200
Barium		180	64	93	58	58	180	110	91	2,000
Beryllium		0.84								500
Chromium		8.1								1,000
Copper		9.7		2.1						650
Lead			1.2	3.4	6.0	4.1		1.3	2.2	100
Mercury					0.14				0.14	10
Nickel		51	43	18		31		5.9	8.7	2,000
Selenium		19	3.7	4.3		4.8		2.9	3.4	50
Silver		2.3								NS
Tin		26								NS
Vanadium		54								NS
Zinc		4	12	18		6.5				10,000
Miscellaneous Parameters										
1,4-Dioxane	800									NS
2,4,5-Trichlorophenol					7.6			26.8		NS
2,6-Dichlorophenol		250		6,560		498				NS
2-Hexanone										NS
2-Methylnaphthalene				81				3.8		NS

Table 2-19
Phase II RFI Groundwater Sample Results - SWMU #10

Constituent	FG-11GW	FG-12GW	FG-13GW	FG-14GW	G343	G344	G347	G348	G349	Groundwater Quality Standard[1]
Acetone	950	499				398				NS
Acetonitrile	722	15.6			4.2	51.2			101	NS
Acetophenone									7.1	NS
Aniline		418	2,850	5,190		706		2,960	128	NS
Dibenzofuran						4.0				NS
Isobutyl alcholol					12					NS
Methacrylonitrile	200									NS
Methyl-iso-butyl ketone	5,380	582	3,640	18,600		1150		171	337	NS
Pyridine				85		4.6		5.3	1.2	NS
Styrene				4,180					1,980	500
m+p-Cresols		543	7.2	35,500	5.5	37.6		9.7	81.5	NS
m-Xylene		341	338	6,480		141		98.4	1,260	10,000
o+p-Xylenes		402	234	5,060		130		77.5	1,090	
o-Cresol		70	14	721	5.2	36.0			11.9	NS
o-Toluidine		82								NS
p-Chloroaniline		1,800	13,500	42,900		4,120		6,860	39.5	NS

NS - No Standard
All results reported in μg/L unless otherwise noted.
[1] Title 35 IAC 620.420 Groundwater Quality Standards for Class II Groundwater.
Concentrations exceeding Class II Groundwater Quality Standards have been shaded.

Table 2-20 Phase I RFI Soil Sample Results - SWMU #10												
Chemical	B345F1	B345F2	B346F1	B346F2	G344F1	G344F2	G347F1	G347F2	G348F1	G348F2	G349F1	G349F2
Acenaphthene												
Anthracene												
Benzene	31.4	1.5			3	51.4				6.1		154
Benzo(a)anthracene												
Benzo(b)fluoranthene												
Benzo(ghi)perylene												
Benzo(k)fluoranthene												
Benzo(a)pyrene												
Bis(2-ethylhexyl)phthalate	9,370	210				1,400			990			
Chlorobenzene	63		322		1.9	13.4				15.8		68
Chloroform									1.79			
Chrysene								379				
DDT					241							
Di-n-butyl phthalate				310					950			
1,1-Dichloroethane										1.8		
1,2-Dichloroethane	12.7				1.7	12.2			5.45	2.1		
1,1-Dichloroethylene									10.8	2		
Dieldrin					304							
Endosulfan sulfate					4,040							
Endrin			128		1,160							
Endrin aldehyde												
Ethylbenzene	13	1.4	863		6.2	88.5				11.9	20	1,790
Fluoranthene			2,000	477	2,200			903	210	594	576	
Fluorene			1,400									
Heptachlor												
Hexachlorobenzene									7,460		2,020	
Hexachlorobutodiene									437			
Alpha-BHC					624							

Table 2-20
Phase I RFI Soil Sample Results - SWMU #10

Chemical	B345F1	B345F2	B346F1	B346F2	G344F1	G344F2	G347F1	G347F2	G348F1	G348F2	G349F1	G349F2
Indeno(1,2,3-c,d)pyrene												
Isophorone										758		
Methylene chloride	59.7	18.6	98.8	8.99	21.9	42.2	25	16	15.7	11.8	173	405
Naphthalene						4840				649	534	3140
Nitrobenzene	777											
Phenanthrene			6,500	440				590	430	490	290	
Pyrene			1,900	410	1,900			1,030	230			
Tetrachloroethylene											976	424
Toluene	191	13.2	622	1.4		217			1.5	256	35	2,720
1,2,4-Trichlorobenzene									1,270			
1,2-Trans-dichloroethylene					1.3							
1,1,1-Trichloroethane									5.13			
1,1,2-Trichloroethane									3.6			
Trichloroethylene					2.65	3.4			2.08	19	353.8	45
Trichlorofluoromethane		1.8			2.1		2.9				14	
Vinyl Chloride												
Ionizable Organics												
2-Chlorophenol	21,500	6,170										
2,4-Dichlorophenol	2,660	1,130	6,740						1,930			
Phenol	4,390		2,050	1,680		3,620					1,450	
Inorganics												
Antimony	11,000	30,000	29,000	20,000			9,200	7,100	1,800	20,000	5,500	14,000
Arsenic	19,000	31,000	27,000	15,000	15,000	21,000	7,500	3,700	1,900	31,000	13,000	30,000
Beryllium	3,000	26,000	2,600	1,600	2,200	2,200	260	50	50	3,000	1,600	2,000
Cadmium	6,600	3,600	1,600	2,500	6,100	5,800			94	6,300	870	2,200
Chromium (6+)	76,000	79,000	68,000	43,000	38,000	39,000	10,000	3,400	4,200	52,000	60,000	47,000
Copper	47,000	31,000	33,000	20,000	50,000	31,000	25,000	4,800	5,100	21,000	22,000	22,000
Lead	57,000	46,000	51,000	37,000	130,000	68,000	24,000	55,000	9,500	89,000	75,000	32,000

Table 2-20
Phase I RFI Soil Sample Results - SWMU #10

Chemical	B345F1	B345F2	B346F1	B346F2	G344F1	G344F2	G347F1	G347F2	G348F1	G348F2	G349F1	G349F2
Mercury	82		120	180	160	73	70	96		82	160	72
Nickel	40,000	44,000	38,000	24,000	19,000	20,000	23,000	4,000	5,300	22,000	28,000	27,000
Selenium	1,700	4,200	2,700	2,200	2,500	3,300	130			3,800	4,200	2,700
Silver	3,700	470			2,700	1,600					590	270
Thallium	1,700	3,800	2,300	1,500	1,700	1,800	380			3,400	880	3,100
Zinc	425,000	476,000	308,000	252,000	239,000	190,000	52,000	38,000	29,000	428,000	210,000	250,000

All units reported in μg/kg unless otherwise noted.

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Table 2-21
Phase II RFI Soil Sample Results - SWMU #10

Constituent	FG-11S	FG-11D	FG-12S	FG-12D	FG-13S	FG-13D	FG-14S	FG-14D
Acenaphthene				1,400			843	
Anthracene				4,320			2,550	1,500
Benzene		2,280		67.1	180	160		828
Benzo(a)anthracene				5,800			3,660	3,800
Benzo(b)fluoranthene				4,000			2,800	2,700
Benzo(ghi)perylene							2,070	
Benzo(a)pyrene				4,680			3,120	3,300
Bis(2-ethylexyl)phthalate		1,100					430	
Chlorobenzene					580	180		71
Chrysene				6,400			3,980	4,480
Di-n-butyl phthalate	1,600	2,510	8,640				2,480	
Di-n-octyl-phthalate		280						
1,1-Dichloroethane						460		
1,2-Dichloroethane		235						
1,1-Dichloroethylene							53.6	
Ethylbenzene				216	4,070	946	42	623
Fluoranthene		180	150	13,700			8,750	7,120
Fluorene		35		3,000			1,270	
Hexachlorobenzene					8,930			
Indeno(1,2,3-c,d)pyrene			766	1,060			2,100	
Methylene chloride				45		542		476
Naphthalene		55		2,740	1,400		3,830	2,910
Nitrobenzene					2,480			
Phenanthrene		150		18,800				7,550
Pyrene		442	110	11,200				6,710
Tetrachloroethylene					410	140		
Toluene				349	7,110	4,830	272	4,200
1,1,2-Trichloroethane				32.5				

Table 2-21 Phase II RFI Soil Sample Results - SWMU #10								
Constituent	**FG-11S**	**FG-11D**	**FG-12S**	**FG-12D**	**FG-13S**	**FG-13D**	**FG-14S**	**FG-14D**
Trichloroethylene					190		3.2	
Trichlorofluormethane	22.4							
2,4,6-Trichlorophenol		280			4,650	2,400		
Vinyl Chloride			62.9	693			138	
Ionizable Organics								
2-Chlorophenol		1,060			4,610	3,700		
2,4-Dichlorophenol		1,930	300		65,000	44,400	3,000	2,100
Phenol		963	435	3,180	1,690			
Inorganics								
Arsenic	6,300	26,000	2,100	4,100	2,400	5,600	25,000	18,000
Beryllium	790	2,300	660	1,200	480	1,200	2,900	1,100
Cadmium	2,800	9,100	870	3,300	800	2,500	9,200	4,200
Chromium	141,000	18,000	7,400	36,000	11,000	27,000	66,000	25,000
Copper	46,000	35,000	7,300	17,000	8,000	18,000	30,000	33,000
Lead	74,000	62,000	22,000	24,000	29,000	55,000	39,000	100,000
Mercury	100	66		67		70		160
Nickel	17,000	36,000	4,100	15,000	7,100	21,000	33,000	34,000
Selenium		2,600	200	390	150	820	4,500	1,700
Silver	470	400	320	350	240		470	470
Thallium	260	3,000				330	2,500	1,800
Zinc	140,000	341,000	21,000	77,000	42,000	100,000	369,000	130,000

All units reported in µg/kg unless othewise noted.

reports\cleanhbr\cmp\2-21.tbl

Table 2-22 Volatile Organic Compounds Detected in RFI Phase II Clay Samples							
Constituent	**C-2R**	**C-3**	**C-4**	**C-2R**	**C-3**	**C-4**	**C-6**
Sample Depth	30-32	28-30	32-34	54-56	52-54	56-58	54-56
Below Clay-Fill Contact (ft)	15	15	15	40	40	40	40
Acetone	461	ND	ND	ND	ND	ND	ND
Acetonitrile	3,040	ND	ND	ND	ND	ND	ND
Methyl ethyl ketone	ND	ND	ND	ND	ND	13	ND
Methylene chloride	ND	ND	ND	85	ND	ND	ND
Toluene	ND	ND	9	ND	ND	ND	ND
Trichloroethylene	ND	ND	ND	48	ND	ND	ND
Trichlorofluoromethane	ND	13	ND	ND	21	ND	19

All units reported in μg/kg.

reports\cleanhbr\cmp\2-22.tbl

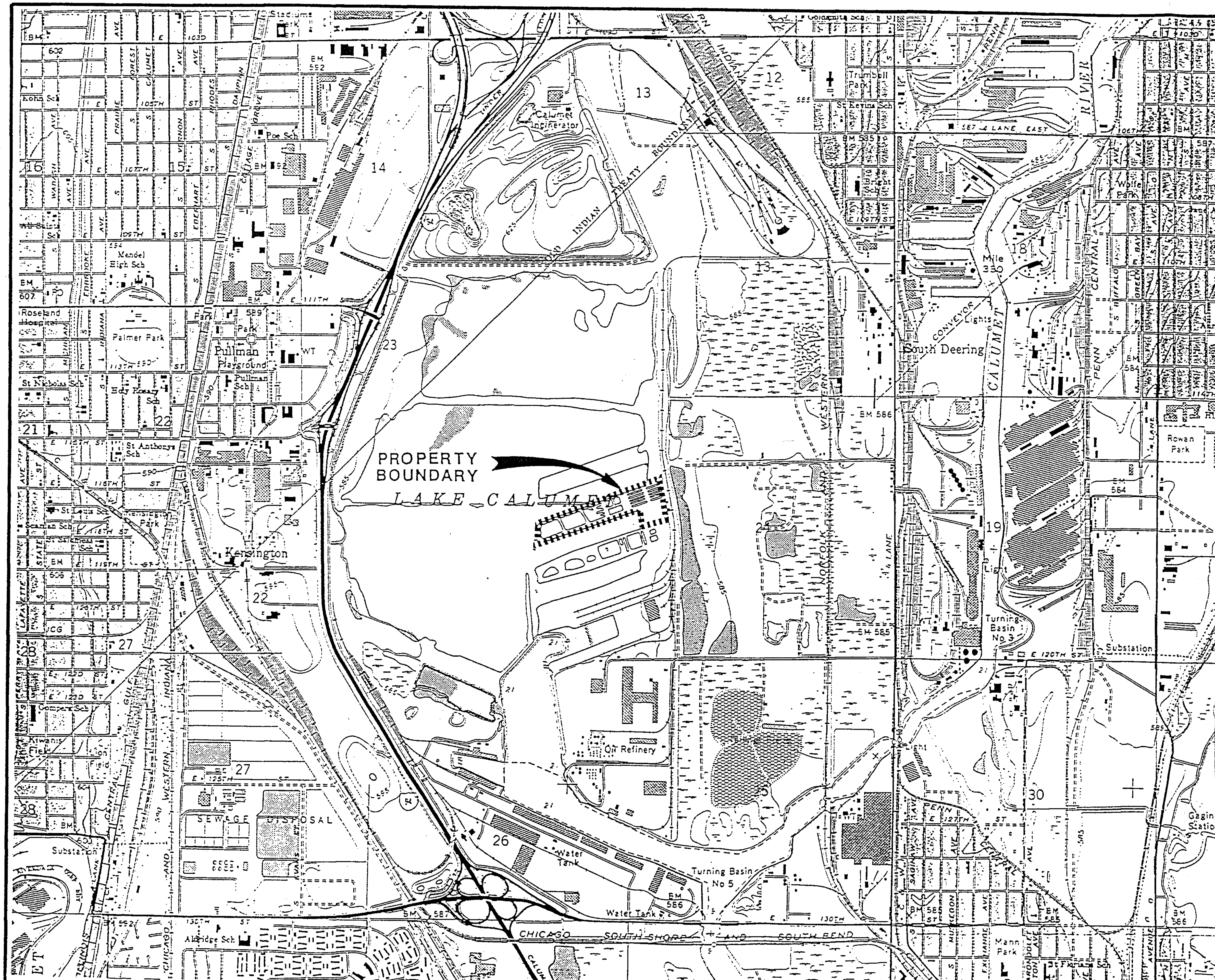
Table 2-23 Semivolatile Organic Compounds Detected in RFI Phase II Clay Samples				
Sample Location	**Depth (ft)**	**Below Clay Fill Contact (ft)**	**bis(2-Ethylhexyl)phthalate**	**Di-n-octyl phthalate**
C-1	25-27	5	3,870	2,620
C-2	20-22	5	4,810	6,080
C-2R	20-22	5	ND	4,300
C-3	20-24	5	6,140	1,900
C-4	22-24	5	41,500	6,910
C-5	22-24	5	6,640	3,980
C-6	20-22	5	ND	4,660
C-7	27-29	5	11,000	3,970
C-1	35-37	15	7,690	4,350
C-2	30-32	15	9,410	6,580
C-2R	30-32	15	ND	2,670
C-3	28-30	15	7,370	17,600
C-4	32-34	15	ND	4,090
C-5	30-32	15	4,120	8,510
C-6	30-32	15	ND	2,280
C-7	-2	15	10,800	4,250
C-1	59-61	40	7,750	3,070
C-2R	54-56	40	ND	5,810

Table 2-23 Semivolatile Organic Compounds Detected in RFI Phase II Clay Samples				
Sample Location	**Depth (ft)**	**Below Clay Fill Contact (ft)**	**bis(2-Ethylhexyl)phthalate**	**Di-n-octyl phthalate**
C-3	52-54	40	3,870	12,000
C-4	56-58	40	ND	4,460
C-5	54-58	40	4,450	15,200
C-6	54-56	40	ND	2,020
C-7	59-61	40	7,600	14,900

All units reported in $\mu g/kg$.

reports\cleanhbr\cmp\2-23.tbl

FIGURES



BASE MAP SOURCE:
USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE, LAKE CALUMET, ILLINOIS-INDIANA, DATED 1965, PHOTOREVISED 1973, PHOTOINSPECTED 1977.

-N-

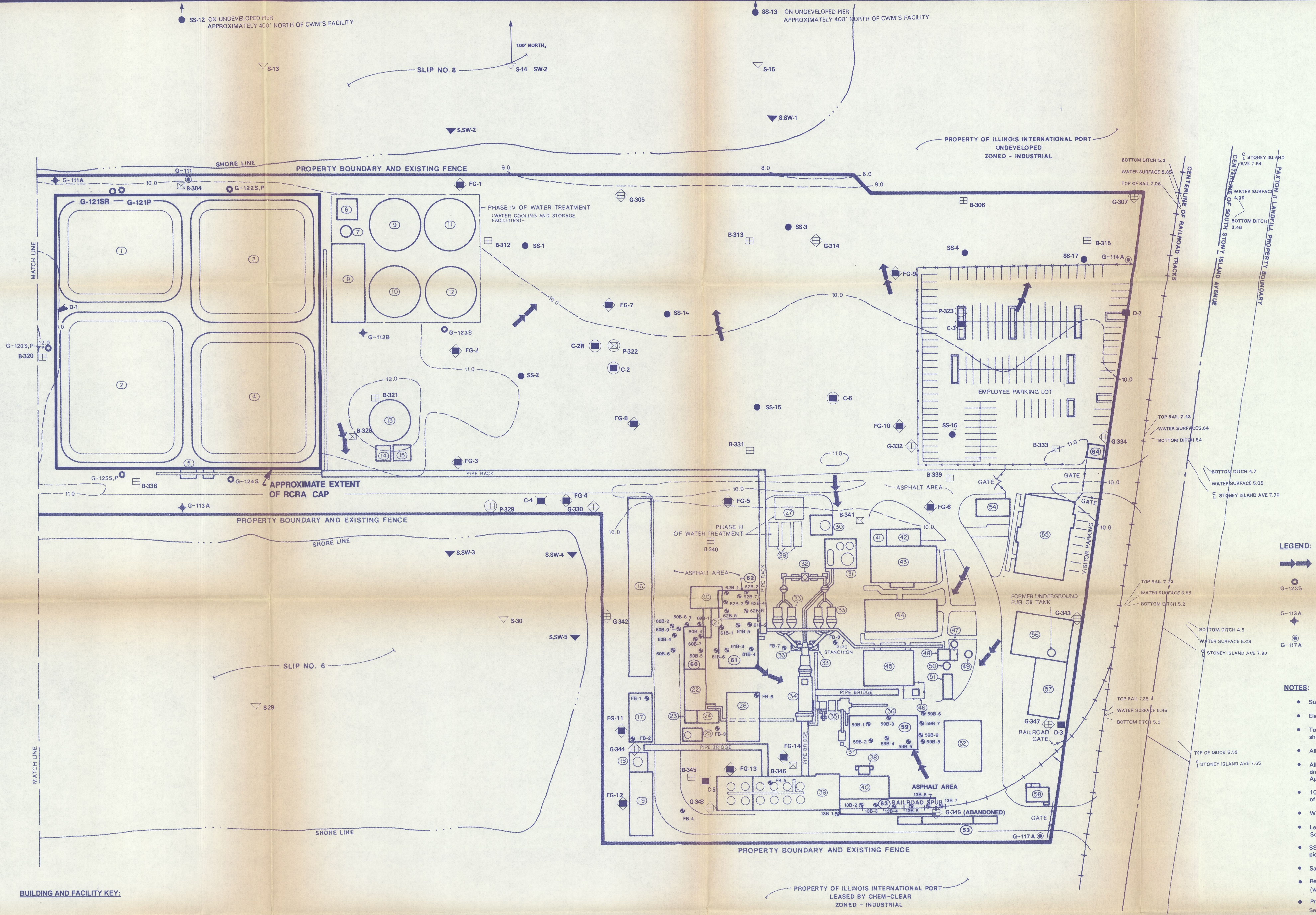
NOV. 29 1995

SCALE: 1"=2000'

CLEAN HARBORS FACILITY
CHICAGO, ILLINOIS
FORMER CWMCS CHICAGO INCINERATOR

FIGURE 1-1
SITE LOCATION MAP

DRN-BY EAP	PROJECT 25713-012
DATE NOV. 1995	**DAMES & MOORE**



RFI WELLS	TOP OF PVC	TOP OF METAL LID	GROUND ELEV
G302	13.66	14.19	11.2
G303	12.82	13.47	10.3
G305	11.48	12.05	9.1
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G342	12.48	13.23	10.4
G343	11.97	12.49	9.0
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G347	12.30	12.82	9.3
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* G324A not included in groundwater monitoring network; for water level only.

* G-314 repaired 10/21/91.

LEGEND:

DIRECTION OF SURFACE WATER DRAINAGE

G-123S ASSESSMENT WELLS INSTALLED IN 1985 WELL LOCATIONS CONSIST OF ONE STAINLESS STEEL AND ONE PVC WELL INSTALLED SIDE BY SIDE

G-113A RCRA MONITORING WELLS INSTALLED IN 1981

G-117A OTHER MONITORING WELLS INSTALLED IN 1981

NOTES:

- Surface elevation has contour interval of one foot.
- Elevations shown on this drawing are based upon Chicago city datum.
- To convert to mean sea level datum add 579.88 feet to the elevations shown.
- All facilities shown are existing as of Dec. 1991 unless otherwise indicated.
- All utilities an underground piping (used or abandoned) are shown on drawings 1478-H-72 and 0-A-022, provided by SCA Chemical Services. See Appendix 3 of workplan. May 1988 Work Plan
- 100-year flood plain does not extend beyond limits of Lake Calumet in vicinity of facility.
- Windrose is shown on Figure 2-2 of May 1988 Work Plan
- Legal description of site is documented in supporting text May 1988 Work Plan See Section 2-2
- SS-11, SS-12 and SS-13 are evenly spaced along undeveloped pier directly north of pier occupied by Chicago Incinerator Facility.
- Sample locations RFI Phase II, Fall, 1991, verified in field.
- Replacement well G-123SR installed September 28, 1995. (well G-123S abandoned at same time)
- Preconstruction borings for areas 59, 60, 61, 62 and 63 advanced in September 1994.
- Foundation soil borings FB-1 through FB-8 advanced by Salisbury Engineering.

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1. Former Solids Retention Basin/ Secondary Storm Water Basin (total capacity - 300,000 gallons) no longer in use
2. Former Storm Water Pond (total capacity - 700,000 gallons) no longer in use
3. Former Cooling/Settling Pond (total capacity - 500,000 gallons) no longer in use
4. Former Cooling/Settling Pond (total capacity - 500,000 gallons) no longer in use
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25 Nitrogen Storage Area

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62. Truck Pad
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64. Guard Shack

NOTE: Buildings and facilities are current as of November 1995.

PHASE I INVESTIGATION LEGEND

B-331 SAMPLING POINT (SAMPLES COLLECTED CONTINUOUSLY THROUGH FILL ONLY)

B-304 SOIL SAMPLING POINT (SAMPLES COLLECTED CONTINUOUSLY THROUGH FILL AND 10 FEET INTO UNDERLYING CLAY)

P-323 SOIL SAMPLING POINT CONVERTED INTO PIEZOMETER (WATER LEVEL DATA ONLY; NO GROUNDWATER SAMPLES COLLECTED)

G-334 SOIL SAMPLING POINT CONVERTED INTO RFI GROUNDWATER MONITORING WELL

S-14, SW-2 SEDIMENT SAMPLING POINT (S) OR SEDIMENT SAMPLING POINT AND SURFACE WATER SAMPLING POINT (S, SW)

PHASE II LEGEND

D-1 STRATIGRAPHIC BORING. (SOIL SAMPLES COLLECTED CONTINUOUSLY TO BEDROCK. ROCK CORE 10 FEET INTO BEDROCK.)

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L-1 VAULT SAMPLE. (LEACHATE SAMPLE COLLECTED WITH A HYDROPUNCH II. NO FILL SAMPLES COLLECTED.)

S, SW-1 SEDIMENT AND SURFACE WATER SAMPLES

SS-1 SURFACE SOIL SAMPLES

CLEAN HARBORS FACILITY
CHICAGO, ILLINOIS

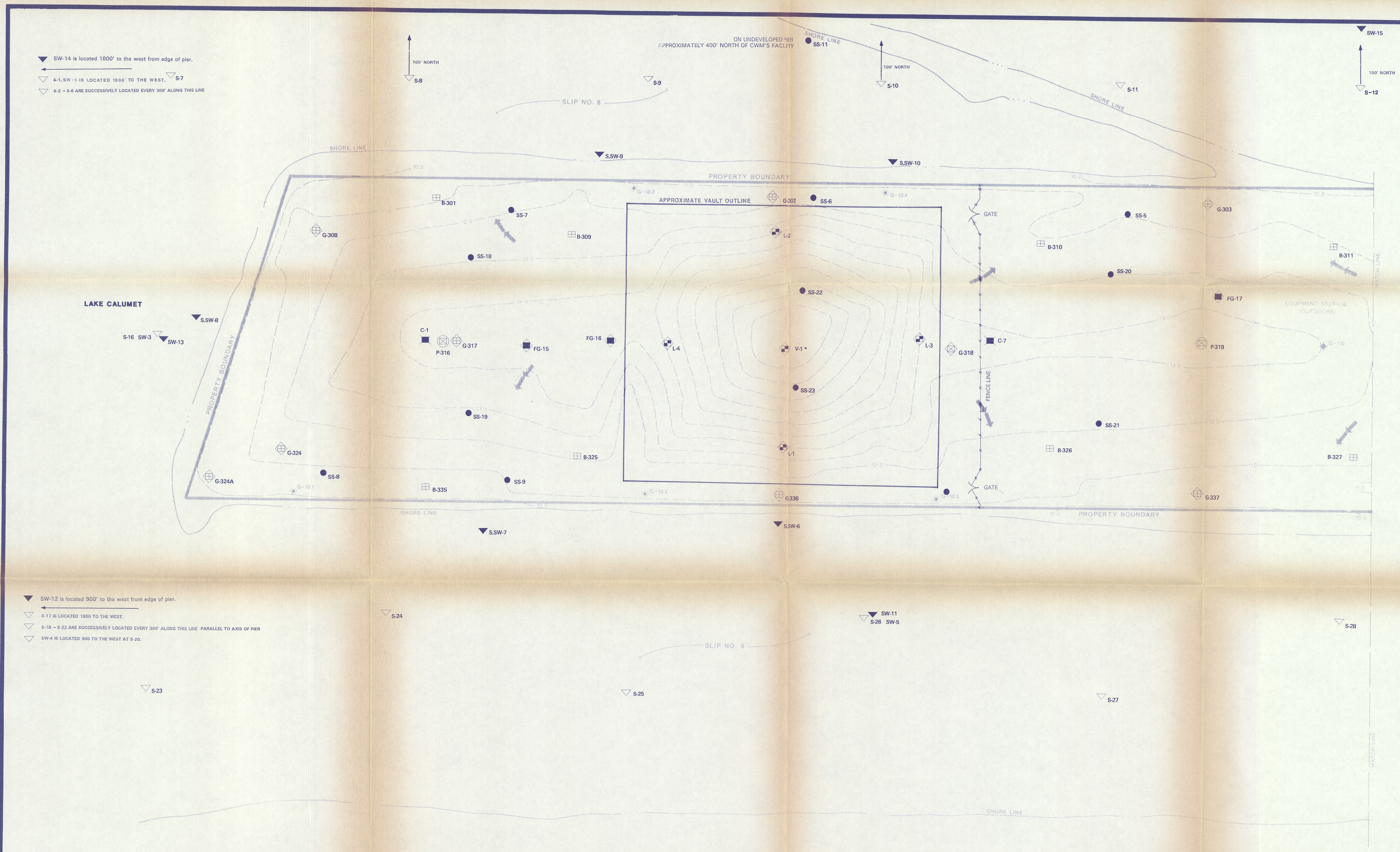
FORMER CWMCS CHICAGO INCINERATOR FACILITY

FIGURE 2-1
SITE MAP

NOV. 29 1995

DRAWN BY: EAP		SCALE: 1" = 50'	0 50 100 SCALE IN FEET
CHECKED BY:			
APPROVED BY:		PROJECT NO: 25713-012	SHEET 1 OF 2

Dames & Moore MADISON, WISCONSIN 53704 (608) 244-1788



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LEGEND:

DIRECTION OF SURFACE WATER DRAINAGE

G-103 MONITORING WELLS INSTALLED IN 1981

G-110 RCRA MONITORING WELL INSTALLED IN 1981

PHASE I INVESTIGATION LEGEND

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SS-1 SURFACE SOIL SAMPLES

CLEAN HARBORS FACILITY
CHICAGO, ILLINOIS

FORMER CWMCS CHICAGO INCINERATOR FACILITY

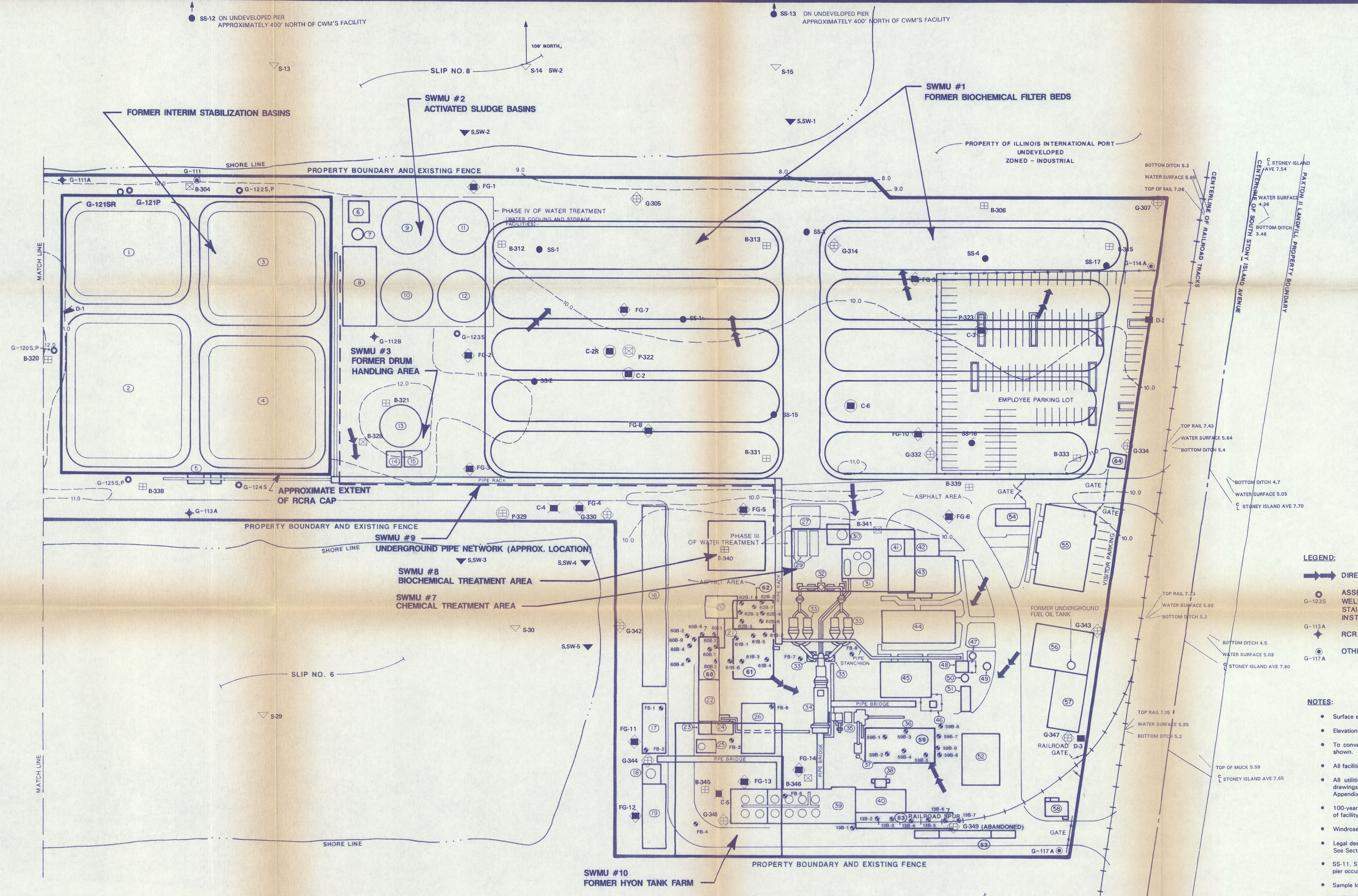
RECEIVED
DEC 06 1995
IEPA-BOL
PERMIT SECTION

FIGURE 2-1 (cont.)
SITE MAP

NOV. 29 1995

DRAWN BY: EAP		SCALE: 1" = 50'	0 50 100 SCALE IN FEET
CHECKED BY:			
APPROVED BY:		PROJECT NO: 25713-012	SHEET 2 OF 2

Dames & Moore MADISON, WISCONSIN 53704 (608) 244-1788



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NOTE: Buildings and facilities are current as of November 1995.

PROPERTY OF ILLINOIS INTERNATIONAL PORT
LEASED BY CHEM-CLEAR
ZONED - INDUSTRIAL

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S, SW-1 SEDIMENT AND SURFACE WATER SAMPLES

SS-1 SURFACE SOIL SAMPLES

CLEAN HARBORS FACILITY
CHICAGO, ILLINOIS

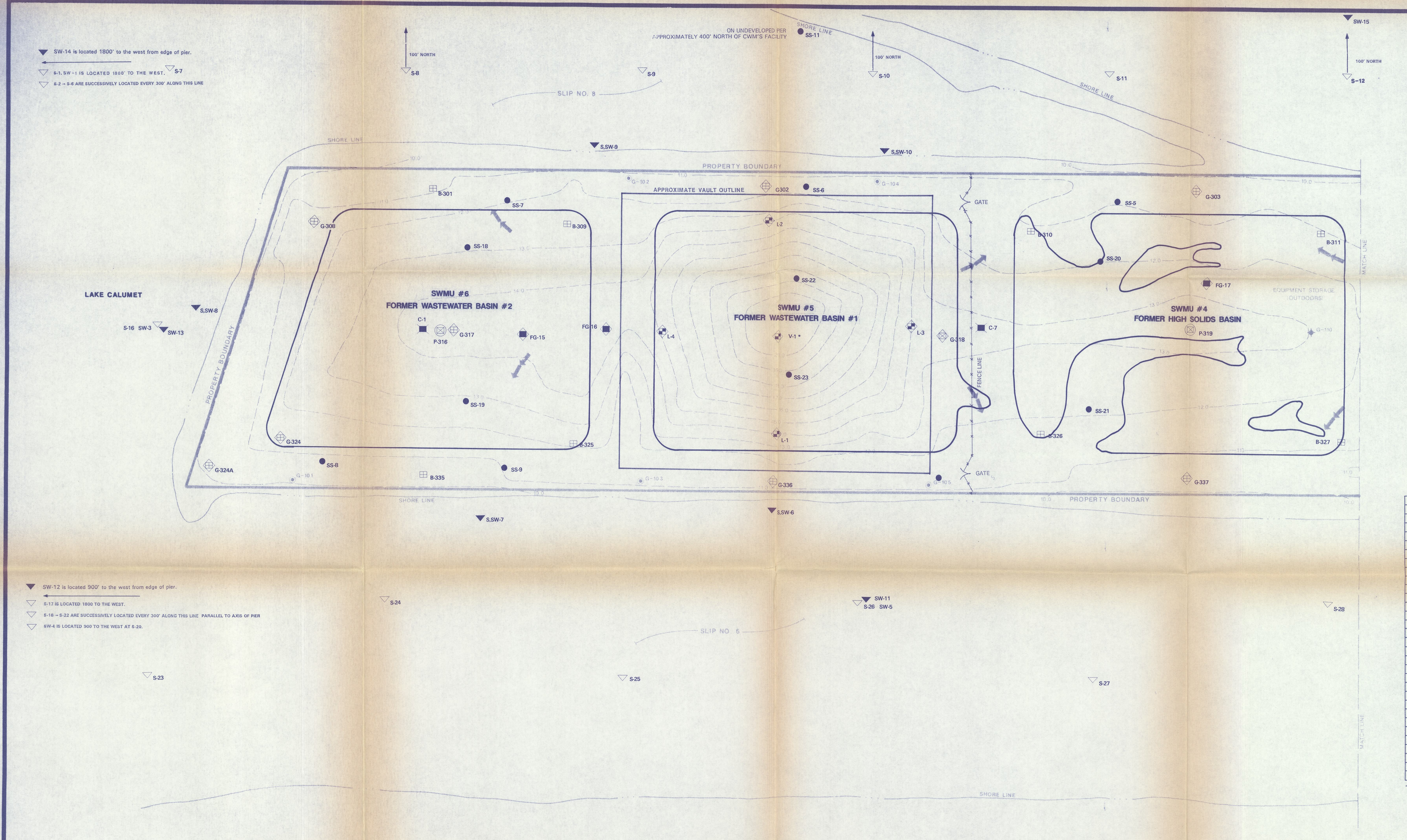
FORMER CWMCS CHICAGO INCINERATOR FACILITY

FIGURE 2-2
FORMER HYON SWMUs

RECEIVED
DEC 06 1995
IEPA-BOL
PERMIT SECTION
NOV. 29 1995

DRAWN BY: EAP	SCALE: 1" = 50'	0 50 100 SCALE IN FEET	
CHECKED BY:			
APPROVED BY:	PROJECT NO: 25713-012		SHEET 1 OF 2

Dames & Moore MADISON, WISCONSIN 53704 (608) 244-1788



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G318	15.18	15.83	12.7
G324	13.43	14.04	10.8
G324A*	12.10	12.57	9.4
G330	12.83	13.46	10.0
G332	12.45	13.01	10.0
G334	12.56	13.08	10.0
G336	13.07	13.66	10.9
G337	12.01	12.98	9.8
G342	12.48	13.23	10.4
G343	11.97	12.49	9.0
G344	13.15	13.80	10.6
G347	12.30	12.82	9.3
G348	13.03	13.58	10.5
G349	13.51	14.08	10.9
G120S	13.96	14.13	11.8
G121SR	16.51	17.10	11.7
G123	14.25	14.46	11.8
G124S	13.40	13.57	11.2
RFI PIEZOMETER			
P316	17.50	18.09	15.1
P319	15.06	15.74	12.6
P322	11.63	12.27	9.4
P323	11.49	12.37	9.3
P329	12.40	12.88	9.9

* G324A not included in groundwater monitoring network; for water level only.

NOTES:

- Surface elevation has contour interval of one foot.
- Elevations shown on this drawing are based upon Chicago city datum.
- To convert to mean sea level datum add 579.88 feet to the elevations shown.
- All facilities shown are existing as of Dec. 1991 unless otherwise indicated.
- All utilities an underground piping (used or abandoned) are shown on drawings 1478-H-72 and 0-A-022, provided by SCA Chemical Services. See Appendix 3 of May 1988 Work Plan
- 100-year flood plain does not extend beyond limits of Lake Calumet in vicinity of facility.
- Windrose is shown on Figure 2-2 of May 1988 Work Plan
- Legal description of site is documented in May 1988 Work Plan. See Section 2-2
- SS-11, SS-12 and SS-13 are evenly spaced along undeveloped pier directly north of pier occupied by Chicago Incinerator Facility.
- Sample locations RFI Phase II, Fall, 1991, verified in field.

LEGEND:

DIRECTION OF SURFACE WATER DRAINAGE

G-103 MONITORING WELLS INSTALLED IN 1981

G-110 RCRA MONITORING WELL INSTALLED IN 1981

PHASE I INVESTIGATION LEGEND

B-331 SAMPLING POINT (SAMPLES COLLECTED CONTINUOUSLY THROUGH FILL ONLY)

B-304 SOIL SAMPLING POINT (SAMPLES COLLECTED CONTINUOUSLY THROUGH FILL AND 10 FEET INTO UNDERLYING CLAY)

P-323 SOIL SAMPLING POINT CONVERTED INTO PIEZOMETER (WATER LEVEL DATA ONLY; NO GROUNDWATER SAMPLES COLLECTED)

G-334 SOIL SAMPLING POINT CONVERTED INTO RFI GROUNDWATER MONITORING WELL

S-14, SW-2 SEDIMENT SAMPLING POINT (S) OR SEDIMENT SAMPLING POINT AND SURFACE WATER SAMPLING POINT (S, SW)

PHASE II LEGEND

D-1 STRATIGRAPHIC BORING. (SOIL SAMPLES COLLECTED CONTINUOUSLY TO BEDROCK. ROCK CORE 10 FEET INTO BEDROCK.)

C-1 CLAY SAMPLES. (SOIL SAMPLES COLLECTED CONTINUOUSLY TO BEDROCK. ROCK CORE 10 FEET INTO BEDROCK.)

C-3 CLAY SAMPLES. (SOIL SAMPLES COLLECTED CONTINUOUSLY TO A DEPTH OF 40 FEET BELOW CLAY FILL HORIZON. TEMPORARY PIEZOMETERS INSTALLED AT DEPTHS CORRESPONDING TO CLAY SAMPLES. WATER LEVEL DATA ONLY, NO GROUNDWATER SAMPLES COLLECTED.)

FG-1 FILL GROUNDWATER SAMPLES. (FILL SAMPLES COLLECTED AT SHALLOW AND DEEP HORIZONS. GROUNDWATER SAMPLED BETWEEN TWO HORIZONS WITH A HYDROPUNCH II.)

L-1 VAULT SAMPLE. (LEACHATE SAMPLE COLLECTED WITH A HYDROPUNCH II. NO FILL SAMPLES COLLECTED.)

S, SW-1 SEDIMENT AND SURFACE WATER SAMPLES

SS-1 SURFACE SOIL SAMPLES

CLEAN HARBORS FACILITY
CHICAGO, ILLINOIS

FORMER CWMCS CHICAGO INCINERATOR FACILITY

FIGURE 2-2 (cont.)
FORMER HYON SWMUs

DRAWN BY: EAP		SCALE: 1" = 50'	0 50 100 SCALE IN FEET
CHECKED BY:			
APPROVED BY:		PROJECT NO: 25713-012	SHEET 2 OF 2

Dames & Moore MADISON, WISCONSIN 53704 (608) 244-1788

APPENDICES

Appendix A
Overview of Investigations

Overview of Investigations Undertaken at the Former CWMCS Chicago Incinerator

The following summary of investigations is provided in chronological order:

1. A foundation investigation by Salisbury Engineering, Inc., for which eight borings were drilled from 30 to 60 feet in the process area for the purpose of providing foundation recommendations for the then proposed site facilities, September 1980.

2. A geotechnical investigation by Soil Testing Services, Inc. which included three 32 foot boreholes, November 1980.

3. Monitoring well installation reports prepared by Testing Services Corporation (TSC) for the installation of wells G101 to G105 and G110 to G118, and designated replacement wells (by letters A or B), 1981 and 1982.

4. A geotechnical investigation by TSC involving the installation of eight borings in the incineration process area, 1983.

5. A RCRA Part B Permit Application was prepared by Waste Management, Inc., March 1985.

6. Geotechnical investigation by Acres American of the TF Facility which included the installation of five piezometers in the former bio-bed areas, December, 1984.

7. Hydrogeologic investigation by Woodward-Clyde evaluating hydraulic conductivity in monitoring wells G111A and G112B, and a hydrographic survey of Slips 6 and 8, July 1985.

8. A hydrogeologic assessment and an evaluation of water quality by P.E. LaMoreaux & Associates, August 1985.

9. A surface electromagnetic survey of the buried pipeline that conveyed process water from the incinerator to the surface impoundments performed by Hydrosearch, Inc., June 1986. Areas of high conductivity were defined.

10. Hydrogeologic review and assessment by Golder Associates (two reports) to provide recommendations for any modifications to the existing groundwater monitoring program, and to evaluate if the existing surface impoundments affected groundwater, June 1986 and August 1987. These involved the installation of the G121 - G125 series monitoring wells in the surface impoundment area. This work concluded that the surface impoundments were not the source of groundwater contamination, but that historical site usage by previous owners and the variable nature of the fill was the cause.

11. A RCRA Part B Permit Application was prepared by SCA Services, Inc., April, 1987.

12. The State of Illinois conducted water quality studies in the Lake Calumet area during the 1980s. A recent study by the Illinois State Water Survey entitled "Groundwater Quality Investigation and Monitoring Program Design for the Lake Calumet Area of Southeast Chicago" specifically mentioned the CWMCS Incinerator surface impoundments, September 1990. The report concluded no release occurred from the impoundments.

13. A RCRA Part B Permit Application was prepared by Chemical Waste Management, Inc., October 1991.

14. A monitoring well (G126S) was installed near the surface impoundments, December 19 and 20, 1991.

15. Three temporary monitoring wells were installed near G121S and the groundwater was sampled to determine downgradient contamination from G121S., January 2-3, 1992.

16. A subsurface investigation to evaluate the extent of soil contaminants in five areas within the incinerator process area was performed by Dames & Moore and described in a report entitled "Pre-Construction Soil Boring Program; CWMCS - Chicago Incinerator; Clean Harbors of Chicago, Inc.", November, 1994.

17. A RCRA Facility Investigation was performed by Dames & Moore in the incinerator and pier areas to evaluate the extent of soil and groundwater contamination from the former Hyon SWMUs from 1989 - 1994. This included a subsurface investigation of the fill and clay soils underlying the facility, the installation of several monitoring wells to evaluate groundwater flow and water quality, sampling of sediments and surface water in Lake Calumet, sampling of air to evaluate the potential of volatile compounds from exposed soil surfaces, and the development of Ecological and Human Health Risk Assessments. The information developed from these studies were provided in the Final RFI Report on the facility in compliance with a Consent Judgement from USEPA, February, 1995.

Appendix B

Response to January 5, 1995 USEPA Comments

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

JAN 9 - 1995

REPLY TO THE ATTENTION OF:

JAN 0 5 1995

HRE-8J

Certified Mail
Return Receipt Requested

Mr. Kevin K. Hersey
CWM Chemical Services, Inc.
3001 Butterfield Road
Oak Brook, Illinois 60521

Re: Final RFI Report
CWM Chemical Services Inc.
ILD 000 672 121

Dear Mr. Hersey:

The United States Environmental Protection Agency (U.S. EPA) received your letter dated August 19, 1994, and the attachments. The letter was in response to U.S. EPA's June 3, 1994, comments on the CWM Chemical Services (CWMCS) November 3, 1993, Draft RFI Report. As properly characterized in your letter, the 1988 Consent Judgement does not stipulate that U.S. EPA approve CWMCS's RFI Report (REPORT). Pursuant to paragraph F of the Consent Judgement, after U.S. EPA provides written comments to CWMCS on any preliminary and final report, CWMCS shall amend the report to incorporate U.S. EPA's comments or CWMCS may request a meeting with U.S. EPA to discuss the comments.

On June 3, 1994, the U.S. EPA provided a written response to CWMCS's REPORT. Also, in the June 1994 letter and attachments, U.S. EPA requested that CWMCS amend the REPORT to incorporate all of U.S. EPA's revisions prior to finalizing the REPORT. On July 7, 1994, CWMCS met with U.S. EPA in Chicago to discuss the comments, and on August 19, 1994, you provided a written response (RESPONSE) to U.S. EPA's June 1994 comments. U.S. EPA has completed the review of your RESPONSE. We continue to disagree with a substantial number of items in the RESPONSE. Pursuant to paragraph F of the Consent Judgement, your RESPONSE constitutes the CWMCS' final discussion on U.S. EPA's comments, and adequately satisfies the provisions of paragraph F of the Consent Judgement. Therefore, within twenty one (21) days of receipt of this letter and attachments, CWMCS must now amend the REPORT, incorporating U.S. EPA's comments/revisions as outlined in the June 3, 1994, comments and submit the revised REPORT as the Final RFI Report. If CWMCS resubmits the November REPORT as the Final RFI Report without incorporating U.S. EPA's comments, U.S. EPA will attach a disclaimer to the REPORT, including this document and its attachments. The disclaimer would state that U.S. EPA disagrees with a significant portion of this report, that this Final RFI Report was determined to be deficient in several areas, and that it has not been modified as requested by U.S. EPA.

The U.S. EPA, in its earlier review of the available data in the REPORT, determined that there exists a sufficient threat to human health and the environment at the CWMCS facility to warrant a Corrective Measures Study (CMS). After carefully reviewing your current RESPONSE, and all available data, we continue to hold our same earlier position that a CMS must be conducted at the CWMCS facility. Finally, pursuant to paragraph H of the Consent Judgement, this letter constitutes U.S. EPA's preliminary determination that a CMS is necessary at the CWMCS facility located on 11700 South Stony Island, Chicago, Illinois.

If you have any questions regarding this matter please contact Mr. Jonathan Adenuga at (312) 886-7954 or Tom Turner at (312) 886-6613.

Sincerely yours,

Jonathan Adenuga

Jonathan Adenuga
Technical Enforcement Section 2
RCRA Enforcement Branch

Enclosure

cc: Kostas Dovantzis, PRC

ATTACHMENT 1

U.S. EPA will not address each item in your RESPONSE but will address those items that are critical to the final RFI Report. The following are U.S. EPA's responses to comments on the August 19, 1994, cover letter:

- In item No. 6 of your letter, you state "The REPORT is the product of CWMCS's consultant Dames and Moore. It is unreasonable to require comments and revisions to the REPORT that Dames and Moore either disagrees with or believe to be technically incorrect". U.S. EPA disagrees with you that our June 1993 comments and revisions to CWMCS's REPORT are technically incorrect. The provisions of the 1988 Consent Judgement are binding upon all parties including your Consultant/Agent Dames and Moore. U.S. EPA expects these revisions to the REPORT to be made by either CWMCS or its Agents.

- In item No. 4 of your letter, you state that the highest calculated cancer risk is based on a single compound found in a single sample collected from a single location. However, the procedure followed in the Supplemental Human Health Risk Assessment (SHHRA) in developing exposure point concentrations adheres to the most recent U.S. EPA guidance. Furthermore, Section 5.0 of the SHHRA acknowledges that the calculation of upper-bound exposure point concentrations is one source of uncertainty that may contribute to the overestimation of risk. U.S. EPA believes that the risks presented in the SHHRA were calculated properly.

- In item No. 3 of your letter, you state that the goal of the risk assessment process is to evaluate risk and not establish a "firm basis for corrective action". Your characterization of CWMCS's risk evaluation at the facility is accurate. CWMCS's risk data was presented in the REPORT. However, U.S. EPA's evaluation of the risk data found it lacking in some respect and in some instances we have supplemented the CWMCS risk data in the REPORT by preparing an additional risk assessment to compensate for the missing information in the CWMCS Human Risk Assessment Report. After carefully reviewing CWMCS' risk data and the supplemental data, U.S. EPA concludes that there is a sufficient threat from the CWMCS facility to human health and the environment, due to contaminants discharged to the lake and groundwater contaminant levels exceeding applicable groundwater protection standards for class II groundwater. Also, all future construction activities involving excavation will need to be done by workers wearing personal protective equipment. This conclusion was not based solely on risk data but also on other corroborative data in the REPORT.

- In item No. 2 of your letter, you state that U.S. EPA has ignored analytical data collected on surface water and sediments and has reached significant conclusions concerning the project by relying on flux calculations. CWMCS stated that flux calculations for contaminant discharges into Lake Calumet were useful to help determine where samples should be collected.

U.S. EPA has not ignored surface water and sediment analytical data obtained during the RFI. CWMCS seems to have misinterpreted paragraph 3 of the June 3, 1994, letter. Paragraph 3 stated that U.S. EPA reached a conclusion after all of the information in the REPORT, including flux calculations and comparison of class II groundwater protection standards to onsite groundwater contamination levels, was evaluated and considered.

CWMCS' response is inconsistent with the agreement reached between U.S. EPA and CWMCS before preparation of the draft RFI report. Under that agreement flux calculations were considered necessary to demonstrate the effect that groundwater contamination may have on human health and the environment. In fact, in the draft RFI report, CWMCS proposed that modeling and flux calculations be used to establish alternative groundwater concentration levels.

Finally, contrary to what is stated, these flux calculations were not voluntarily performed by CWMCS to determine where samples should be collected at the CWMCS facility. Rather, CWMCS agreed to perform these calculations after being requested to do so by U.S. EPA. U.S. EPA and CWMCS have used modeling techniques to calculate the contaminant fluxes. These calculations are based on groundwater analytical data and hydrogeologic data obtained by CWMCS during the RFI. However, because contaminants discharging to the lake are infinitely diluted, the organics measured in surface water are mostly nondetectable. This finding is not at all surprising. On the other hand, both CWMCS and U.S. EPA calculations indicate that contaminants are discharged to the Lake. CWMCS has failed to address the large number and concentrations of contaminants detected in groundwater that discharge to the Lake based on the facility's hydrogeologic conditions. These contaminant discharges should be addressed in the CMS.

The following are U.S. EPA's responses to some of the critical items in Attachment 1 of your RESPONSE:

Part 1

- Item No. 1 concludes, "The presence of continuous or discontinuous sand seams in the lower lacustrine layer is not significant. The lower lacustrine unit is separated from the contaminated fill unit by the upper lacustrine unit. This unit is a homogeneous silty clay soil unit approximately 10 feet thick, in which no contaminants were measured in all soil specimens collected from this layer. Consequently, the unit behaves as a barrier to the migration of contaminants".

U.S. EPA does not believe that CWMCS has provided enough data to conclusively support the hypothesis that sand seams are discontinuous. However, to prevent any further delay in finalizing the RFI Report, the issue regarding whether the sand seams encountered during these investigations are discontinuous should be deferred. CWMCS could state in the RFI Report that both the U.S. EPA and CWMCS disagree on the status of the sand seams encountered during the RFI.

• In items 3a, 3c and 25, your responses indicate that the potentiometric surface maps correctly depict groundwater elevations in the vicinity of the vault and that the vault liner is a barrier preventing migration of leachate from the vault or infiltration of groundwater into the vault. Also, CWMCS does not agree that contaminants in monitoring wells G-302 and G-336 originate from the vault but from solid waste management unit SWMU #6.

First, no as-built drawings of the vault are available to show how this vault was constructed. Second, the contaminants in wells G-302 and G-336 are likely the result of preferential migration of contaminants from the vault to the lake. CWMCS implies that similar contamination should have been found in well G-318, but this is not necessarily true because the vault's clay liner may be effectively containing migration in the direction of that well. U.S. EPA believes that the vault's integrity is questionable because of contaminants detected in adjacent downgradient wells G-302 and G-336, and because no construction records or data for the hydraulic head within the vault are available to substantiate CWMCS's statements. The vault may be reducing contaminant migration to the lake, but it does not prevent migration to the lake. As stated in CWMCS's response, leachate may have been generated from infiltrating precipitation, which implies that the vault's cap is permeable. The vault's sidewalls and bottom may also be permeable in certain locations, causing contaminants to slowly and erratically migrate toward monitoring wells G-302 and G-336. The vault area should be addressed in the CMS for the facility.

• In item No. 4, you state that after re-evaluating groundwater results, it was determined that inorganic compounds, including metals, do not indicate a contaminant distribution pattern. CWMCS states that it is impossible to determine if the onsite SWMUs or fill material are the sources of metals in the groundwater. CWMCS also states that the reason metals are not useful in identifying a contaminant distribution can be seen by comparing sample results from phase I and phase II.

U.S. EPA disagrees that inorganic compounds, including metals, do not indicate a contaminant distribution. U.S. EPA also evaluated all of the phase II groundwater sampling results in the REPORT, including soil sample results. A contaminant distribution pattern is still evident. The phase I sampling results were not evaluated because CWMCS has always insisted that the phase I results were unreliable.

• The response in item No. 5, indicates that contamination detected in well G-349 is from an upgradient source rather than from one of the SWMUs investigated during the RFI. CWMCS is responsible for investigating the extent of contamination at the facility, and CWMCS should investigate whether a SWMU or other source on the facility caused this contamination. This source should be addressed in the CMS.

• In item No. 7, CWMCS states that groundwater sample results for wells located between the SWMUs and the lake do not support U.S. EPA's belief that groundwater moving through the fill is contaminating the lake.

U.S. EPA does not agree. Evaluation of the RFI data indicates that contaminants detected at various monitoring wells screened adjacent to the lake and within the source areas of the facility migrate slowly from the facility to the lake. The contaminants are diluted in the lake but continue to deteriorate the lake's water quality.

• In items 8, 10 and 24, your responses are seemingly opine that U.S. EPA's flux calculations are simplistic and unrealistic. CWMCS also states that its calculation of contaminant fluxes using a "next-level-of-sophistication" model results in estimates of discharges that are one order of magnitude lower than those calculated by U.S. EPA.

U.S. EPA's calculations were intended to be simple in order to demonstrate the effect of facility contamination on the environment and to provide examples (such as for benzene, 1,1-dichloroethene, and vinyl chloride at three well locations) of the calculations that the RFI report lacked. U.S. EPA's calculations are realistic given the RFI data and the hydrogeologic conditions at the facility. CWMCS's complex model is, in fact, unrealistic given the facility conditions, and it yields results for the mass rate of discharge of benzene identical to those of U.S. EPA's simpler calculations. U.S. EPA and CWMCS benzene flux results differ by an order of magnitude only because U.S. EPA's assumed area of contaminant discharge is an order of magnitude larger than CWMCS's. Even if an order of magnitude difference exists between the results of these calculations, it is not surprising given the variable hydrogeologic data presented in the RFI report. In any case, U.S. EPA and CWMCS flux calculations both indicate that contaminants discharge to the lake, thus degrading the lake's water quality, but CWMCS has not addressed discharges of the multitude of contaminants detected at high concentrations (relative to applicable groundwater protection standards) throughout the facility. These contaminant discharges should be addressed in the CMS.

• The response in item No. 26 does not address U.S. EPA's comment. The sentence " This contaminant distribution pattern of the fill sample is a reflection of groundwater sample results" should be rewritten as follows: The groundwater sampling results are a reflection of the contaminant distribution pattern in the soils and SWMUs at the facility.

• Your response in item No. 27 did not adequately address U.S. EPA's comment. CWCMS claimed that these polynuclear aromatic hydrocarbons (PAHs) are ubiquitous. On page 23, paragraph 4, the text of Attachment I indicates that the major sources of PAHs contamination are wind, scouring of the lake, and sediment transport by wave action. On page 21, paragraph 4, the text indicates that contaminants in sediments at sampling location S-1 are the result of precipitation runoff and industrial activities in the Lake Calumet area. These explanations are reasonable when applied to the entire area, but PAH contamination in sediments adjacent to the facility is more likely the result of runoff from waste management areas within the CWMCS facility. The contaminated sediments in close proximity to the CWMCS facility must be addressed regardless of whether these contaminants resulted from precipitation runoff. PAHs contaminants identified in the sediment samples also occur in high concentrations in the leachate samples collected from the onsite vault.

U.S. EPA has also compared the dry weight of the parameters found in the sediment sample at S-1 to conservative/screening benchmarks to determine if there is any potential for adverse ecological effects due to these sediment contaminants.

The benchmarks shown in the table (Attachment 1), are the lowest effect level (LEL) from the "Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario" (Persaud, et al.). The effects range median (ER-M) is from the National Oceanic and Atmospheric Administration (NOAA) Technical Memorandum NOS OMA 52 (Long and Morgan), and U.S. EPA sediment quality criteria (SQC).

The dry weight ($\mu g/g$) of each parameter has been converted to the organic carbon normalized concentration ($\mu g/g_{oc}$) to facilitate comparison with the SQC benchmarks. Since no total organic carbon (TOC) value was provided with the data, the TOC was assumed to be 3% for the calculations done here. The conversion is:

$$\mu g/g \div (\%\ TOC \div 100) = \mu g/g_{oc}$$

$$10.1\ \mu g\ \text{Phenanthrene}/g \div (\ 3 \div 100) =\ 336\ \mu g/g_{oc}$$

At sampling location S-1, all of the polycyclic aromatic hydrocarbons (PoAHs) exceed the benchmarks for individual PoAHs and total PoAH. Phenanthrene exceeds the U.S. EPA sediment quality criteria. Based upon this review, further evaluation of the sediments in the proximity of sampling site S-1 is warranted to determine the level of risk to ecological receptors in the vicinity of the site.

Finally, U.S. EPA re-evaluated your response to your conclusion regarding the absence of "any discernable immiscible or dissolved contaminant plumes" originating from the CWMCS facility. We conclude that your claim is incorrect. Volume 3, Appendix L of the RFI REPORT shows that two major dissolved groundwater plumes have existed for various volatile organic compounds (VOC) during both phases of the RFI. One of these plumes encompasses the former biobed area and the Hyon tank farm area. The second plume emanates from the wastewater basin west of the vault, which may be indicative of contamination emanating from the leachate vault. The dissolved VOC plumes depicted in Appendix L include organic compounds such as benzene, 1,1-dichloroethene, phenol, 2,4-dichlorophenol and the semivolatile compound naphthalene. In addition a dissolved arsenic plume is also evident for phase 1. Other plumes are also likely to exist, because the number of organic compounds detected in the onsite groundwater monitoring wells and soils is greater than the number of compounds depicted in Appendix L.

In addition, immiscible contamination such as floating oil and solvent mixtures was observed during field sampling at various locations, particularly adjacent and west of the leachate vault and in the biobed area. Evaluation of the RFI data indicates that these plumes slowly discharge to Lake Calumet and therefore degrade the water quality in the long term. Therefore, corrective measures to alleviate contaminant discharges to the Lake are necessary and must be addressed in the CMS.

- The response in item 28 seems to imply that there are risks from Lake Calumet to recreational users and from fish ingestion. However, dermal absorption or incidental ingestion and fish ingestion are not viable pathways. CWMCS has not clearly defined these risks from Lake Calumet or the source(s) and the appropriate pathways associated with these risks. More importantly, CWMCS must explain any correlation between these risks and the management of hazardous waste at the facility, if any. It has been documented in the REPORT that the groundwater in the fill is highly contaminated and the majority of the hazardous constituents in the groundwater are expected to be released to the Lake. U.S. EPA also is aware that it may be difficult to quantify risk from fish ingestion due to the industrial activities within the Lake area.

Part 3

- In item No. 1, the response states that U.S. EPA's conclusion that it is necessary and practical to restore damaged areas to original condition or as close as possible is irresponsible and unsupported by a technical justification particularly without the benefit of a CMS. To reiterate, the purpose of the RFI is to determine the nature and extent of releases of hazardous waste or hazardous constituents from regulated units, SWMUs and other source areas at the CWMCS facility, and to gather all necessary data to support a CMS and if necessary to remedy these releases. The data and conclusions, as established in the REPORT, to a large extent corroborate and support U.S. EPA's position that the groundwater and soils at the CWMCS facility are highly contaminated and, as such, must be remediated. In addition, soil samples adjacent to the facility were also analyzed and found to contain hazardous constituents. The CMS should now contemplate proposals to remedy these releases. It is not irresponsible to require CWMCS to remedy these releases. Section 3008(h) clearly authorizes U.S. EPA to require corrective action or any other response necessary for any releases of hazardous waste from a facility to protect human health and the environment.

- The response in item No. 2 does not address U.S. EPA's comment. U.S. EPA requested that the CMS consider soil cleanup levels protective of groundwater quality standards found in 35 Illinois Administrative Code (IAC) Subpart B, Sections 620.10 and 620.20. However, CWMCS's response does not address this issue. In addition, on-site monitoring well data should be compared to Class II groundwater protection standards and upgradient monitoring well data to establish whether significant contaminant releases from the facility to groundwater have taken place.

The following are U.S. EPA's responses to Attachment II in your RESPONSE:

● In item No. 6, U.S. EPA acknowledges the existence of Occupational Safety and Health Administration (OSHA) rules and regulations that require the use of personal protective equipment (PPE) to limit or prevent exposure to hazardous contamination. U.S. EPA does not condone or encourage any violations of these rules and regulations. However, in almost any industrial situation instances may arise in which PPE is not used or PPE is damaged, resulting in exposure to contamination. At a minimum, the baseline RA report should acknowledge that the use of PPE is not foolproof and that exposure to contamination may occur despite attempts to follow OSHA rules and regulations.

● In response to item No. 11, Section 5.7.4 of U.S. EPA's *Risk Assessment Guidance for Superfund* (RAGS) indicates that, in general, anthropogenic background chemicals should not be eliminated from the baseline RA because it is extremely difficult at the baseline RA stage to conclusively show that such chemicals (in this case, trichloroethene) are not related to the facility or the surrounding area. Furthermore, trichloroethene was detected in surface soil. It is difficult to imagine how trichloroethene, a volatile organic compound, migrated onto the facility solely from an off-site location and remained on the facility at a concentration high enough to be detected during sampling. The presence of trichloroethene in the surface soil suggests a more immediate and localized source of the contamination. Because the presence of trichloroethene in the surface soil at the facility cannot be attributed solely to off-site sources, the baseline RA report should justify the exclusion of trichloroethene as a contaminant of potential concern based on anthropogenic considerations.

● In item No. 31, your response misses the point of U.S. EPA's original comment. The comment was not referring to resuspension of dust from workers' skin and subsequent inhalation; rather, the comment was referring to the possibility that some of the contaminated dust could be inhaled at the same time that the dust is being deposited on workers' skin. Specifically, the baseline RA report should evaluate the potential for total exposure to fugitive dusts. Also, the baseline RA is supposed to consider reasonable maximum exposure (RME) conditions. Under such conditions, it is reasonable to assume that hygiene practices are not completely followed. Many industrial workers who work out of doors do not have well washed their hands; thus these workers may be exposed to contaminated soil via incidental ingestion of soil. The baseline RA should evaluate the potential for exposure to contaminated soil via incidental ingestion.

The following are U.S. EPA's comments to Attachment III in your RESPONSE:

● In item 1, you stated that it is outside the scope of the ERA report to compare the contaminants detected in surface water and sediment samples to those detected in samples collected at the facility. Because the source of pollutants in Lake Calumet is pertinent to the ERA and because the ERA report discusses the possibility that other sources are responsible for the contamination, some reference to on-site sample results is needed. Although a detailed discussion may not be necessary, at a minimum the ERA report should state whether some or all of the contaminants were also detected at the facility and should refer to another part of the RFI report where this comparison is made.

- In item No. 2, you stated that a survey conducted by Dames & Moore on September 27, 1993, will be referenced to support the conclusion that no threatened or endangered plant and animal species are present at the facility. This response partly addresses U.S. EPA's comment, but additional information is needed to substantiate CWMCS's conclusion. Information on specific areas at the facility, the methods used to conduct plant and animal surveys, and the conditions at the facility during the surveys (including weather conditions and other types of activities that were being conducted, and so on) should be provided.

- In addition, other supporting references are needed to determine whether threatened or endangered species (state-listed as well-as federally designated) occur at the facility. The local office of the U.S. Fish and Wildlife Service (FWS) was contacted for information. However, because the information that FWS offers may be limited, a review of the Illinois natural heritage database should be requested to supplement the information already obtained. Also, a single survey performed on a single day is not sufficient to demonstrate the absence of bird species. Because bird counts are done annually in the vicinity of the facility, the Chicago Audubon Society should be contacted for additional information about sightings of threatened or endangered bird species at the facility and in areas adjacent to Lake Calumet. The assumption that threatened or endangered species will not use the facility or surrounding areas may be inaccurate given the high concentrations of birds that are known to pass through the Lake Calumet area.

- In item No. 4, you provided additional information about threatened or endangered species in the area of the CWMCS facility. However, the first paragraph of the response does not fully address U.S. EPA's comment concerning breeding bird populations. The phrase "or potentially occur" should be deleted from the first sentence because the black-crowned night heron, a state-listed endangered species, is known to nest in the area. In addition, the habits of nearby nesting bird populations should be researched to substantiate the claim that no bird species spend a significant amount of time at or near the facility. Finally, the response addresses only wintering bird populations and does not identify additional species that nest in the area and that forage in Lake Calumet near the facility. The Chicago Audubon Society may be able to provide the missing information.

The response also discusses candidate endangered species known to occur within 5 miles of the facility. The response mentions that five avian species have been observed in the area, but it lists only three of them. The other two avian species should be identified, and the specific locations of all sightings should be researched so that the proximity of the avian species to the facility can be determined.

The following are U. S. EPA's comments to Attachment IV in your RESPONSE:

- **General Comment 2.** The evaluation of potential exposures of construction and utility workers was conducted primarily for the purpose of completeness. U.S. EPA does not condone any violations of OSHA rules and regulations. Sometimes, however, these rules and regulations are not fully followed, and exposures occur. The exposure scenario developed for construction and utility workers represents a conservative, upper-bound estimate of the potential exposures and risks for construction and utility workers even if appropriate rules and regulations are followed.

- **General Comment 3.** Section 5.0 of the SHHRA acknowledges that the calculation of upper-bound exposure point concentrations is one source of uncertainty that may contribute to the overestimation of risk. However, the procedure followed in developing exposure point concentrations adheres to the most recent U.S. EPA guidance. CWMCS's comment offers no alternative procedure for calculating exposure point concentrations other than to suggest that "analytical results obtained from the individual SWMUs may be indicative of conditions within the SWMU only." Even if the exposure frequency were reduced by a factor of up to 10 in order to reflect the smaller size of an individual SWMU as compared with the exposure areas designated in the SHHRA, the total estimated carcinogenic risk to construction workers would still be in the order of 1×10^{-5} and may still exceed 1×10^{-4}.

- **Specific Comment 1.** U.S. EPA acknowledges using background soil samples different from those used by CWMCS in the baseline RA report. Although the source of the fill material upon which the facility and adjacent piers were constructed is not known, U.S. EPA believes that the fill material best represents site-specific background conditions. A comparison of background fill locations with on-site and potentially contaminated fill locations would best establish the nature and extent of site-related contamination.

- **Specific Comment 5.** The SHHRA specifically refers to Figure 2-7 of the RFI report and Table 2 of the SHHRA to describe the exposure areas. Because the potential exposures evaluated in the SHHRA all involve exposure to contamination below grade during construction or utility work, the presence or absence of asphalt at the exposure areas is not significant.

  U.S. EPA acknowledges that the SHHRA evaluated only a portion of the available sediment samples. The sediment samples selected were from locations considered to be those most accessible to subsistence fishermen. U.S. EPA considers the sediment samples collected immediately north of the biobeds and the vault to represent RME conditions.

- **Specific Comment 6. Area A:** Upon review, U.S. EPA acknowledges that samples FG-8, FG-10, and G-123S should have been considered for

Area A. However, considering these samples for Area A would only minimally affect the results of the SHHRA. In addition, sample FG-3 was collected immediately south of the approximate southern boundary of Area A; samples B-331, G-332, and B-333 were collected immediately north of this boundary. Therefore, sample FG-3 was correctly considered for Area B.

U.S. EPA agrees that no analytical data are available for sampling location D-2 and that it should not be listed among the sampling locations for which analytical data are available. However, elimination of sample D-2 from Table 2 will not affect the results of the SHHRA.

Area B: Sample FG-3 was correctly considered for Area B, but samples FG-8 and FG-10 should have been considered for Area A.

Area C: Upon review, U.S. EPA acknowledges that samples B-304, FG-16, G-120S, and G-121S should have been considered for Area C. Because of the cap in the vault area, it was assumed that there would be significant exposure associated with sampling location SS-22; therefore, this location was not considered for Area C. Figure 2-7, which was used to locate the sampling locations, does not show sampling location SS-10. Because this sampling location could not be confirmed, it was not considered for any of the exposure areas.

U.S. EPA acknowledges that inclusion of the sampling locations discussed above would affect the exposure point concentrations and would affect the selection of contaminants of potential concern. However, the extent of these effects is not expected to be significant and is unlikely to impact the overall results of the SHHRA.

Furthermore, upon review of the data included in the SHHRA, it was determined that subsurface samples marked with the suffixes "F2" and "D" were in fact included in the data set. However, it is possible that excavations as deep as 20 feet below ground surface (bgs) could result from construction activities (such as placement of footings or construction of basements). Therefore, it is reasonable to consider analytical results for soil samples collected up to 20 feet bgs during development of exposure point concentrations.

Similarly, as indicated in Table 1 of Attachment IV, the sampling depths of the groundwater samples from locations G-302, G-318, G-324, G-336, G-342, FG1-GW through FG8-GW, and FG10-GW through FG12-GW are all less than 13 feet bgs. U.S. EPA believes that groundwater at these depths would likely seep into an excavation reaching a depth of 10 to 20 feet bgs; therefore, consideration of analytical results for samples from these depths is appropriate.

ATTACHMENT II

COMPARISON OF SEDIMENT CONTAMINANTS TO SCREENING BENCHMARKS

	Dry Weight			Organic Carbon Normalized	
Contaminant	S-1 µg/g	LEL[1] µg/g	ER-M[2] µg/g	S-1 µg/g	SQC µg/g
Benzo(a)pyrene	4.74	**0.370**	2.50	158	
Benzo(b)fluoranthene	9.29				
Benzo(k)fluoranthene	3.60	**0.240**		309	
Chrysene	7.16	**0.340**	2.80	120	
Phenanthrene	10.1	**0.560**	1.38	336	**180**[3]
Pyrene	12.4	**0.490**	2.20	413	
Fluoranthene	16.1	**0.750**	3.60	536	620[4]
PAH (total)	63.4	**4**	35		

[1] **Persaud, D., R. Jaagumagi, and A. Hayton.** August 1993. *Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario.* ISBN 0-7729-9248-7. Ontario Ministry of the Environment.

[2] **Long, E. R. and L. G. Morgan.** 1991. "Potential for Biological Status Effects of Sediment-sorbed Contaminants Tested in the National Status and Trends Program." *NOAA Technical Memorandum NOS OMA 52.* National Oceanic and Atmospheric Administration. Second Printing, August 1991. Seattle, Washington.

[3] **USEPA.** September 1993. *Sediment Quality Criteria for the Protection of Benthic Organisms: Phenanthrene.* EPA-822-R-93-014. Office of Science and Technology, Health and Ecological Criteria Division, Washington, D.C.

[4] **USEPA.** September 1993. *Sediment Quality Criteria for the Protection of Benthic Organisms: Fluoranthene.* EPA-822-R-93-012. Office of Science and Technology, Health and Ecological Criteria Division, Washington, D.C.

RESPONSE TO U.S.EPA'S JANUARY 5, 1995 LETTER. Amended to include responses to items requiring additional time.

ATTACHMENT 5

- **Agency Comment:** In item No. 6 of your letter, you state "The REPORT is the product of CWMCS's consultant Dames and Moore. It is reasonable to require comments and revisions to the REPORT that Dames and Moore either disagrees with or believe to be technically incorrect". U.S.EPA disagrees with you that our June 1993 comments and revisions to CWM-CS's REPORT are technically incorrect. The provisions of the 1988 Consent Judgement are binding upon all parties including your Consultant/Agent Dames and Moore. U.S.EPA expects these revisions to the REPORT to be made by either CWMCS or its Agents.

  CWM-CS Response: The CWM-CS letter of August 19, 1994 does <u>not</u> state that the Agency's comments are technically incorrect. The comment in the letter is as follows: "It is unreasonable to require comments and revisions to the report that Dames and Moore either disagrees with or believes to be technically incorrect." The reason independent professional contractors are employed in conducting these projects is to provide some assurance that professional judgement will be exercised. A critical word in our response is "believes". The use of this word conveys that there is a difference of opinion. A professional difference of opinion exists on a number of issues contained within the Agency's June 3, 1994 letter.

  If the Agency and CWM CS cannot agree on these issues, CWM CS would like to request an "Issue Resolution" process as outlined in the Consent Judgement.

- **Agency Comment:** In Item #4 of your letter, you state that the highest calculated cancer risk is based on a single compound found in a single sample collected from a single location. However, the procedure followed in the Supplemental Human Health Risk Assessment (SHHRA) in developing exposure point concentrations adheres to the most recent U.S. EPA guidance. Furthermore, Section 5.0 of the SHHRA acknowledges that the calculation of upper-bound exposure point concentrations is one source of uncertainty that may contribute to the overestimation of risk. U.S. EPA believes that the risks presented in the SHHRA were calculated properly.

  CWM-CS Response: The Agency correctly summarizes CWM-CS's position on this issue. We generally agree that the Agency followed screening level Agency guidance in the SHHRA. It is our opinion, however, that the application of guidance which uses a single, high concentration, sample to conclude that an entire area, regardless of size, represents an environmental threat is technically questionable. In this case, we prefer to utilize assumptions which are more representative of the overall facility and we believe more representative of the actual risk.

- **Agency Comment:** In Item No. 3 of your letter, you state that the goal of the risk assessment process is to evaluate risk and not establish a "firm basis for corrective action". Your characterization of CWMCS's risk evaluation at the facility is accurate. CWMCS's risk data was presented in the REPORT. However, U.S. EPA's evaluation of the risk data found it lacking in some respect and in some instances we have supplemented the CWMCS risk data in the REPORT by preparing an additional risk assessment to compensate for the missing information in the CWMCS Human Risk Assessment Report. After carefully reviewing CWMCS's risk data and the supplemental data, U.S. EPA concludes that there is a sufficient threat from the CWMCS facility to human health and the environment, due to contaminants discharged to the lake and groundwater contaminant levels exceeding applicable groundwater protection standards for class II groundwater. Also, all future construction activities involving excavation will need to be done by workers wearing personal protective equipment. This conclusion was not based solely on risk data but also on other corroborative data in the REPORT.

CWM-CS Response: In the Agency's June 3, 1994 letter, it is stated that "Our review of your January 11, 1994, Human Health Risk Assessment report have identified a very serious shortcoming." This shortcoming has not been identified and must be inferred from a review of the Agency's SHHRA. The SHHRA, prepared by PRC Environmental Management, addressed two potential receptors, subsistence fishermen and construction /utility workers. A major concern with the SHHRA is the assumptions related to construction/utility workers. Although not acknowledged in the SHHRA, violations of standard operating procedures as well as OSHA regulations would be necessary to achieve the calculated levels of risk to workers. Although the Agency acknowledges the significance of this issue (January 5, 1995 letter, page 7, first bullet item), the Agency maintains the position that the SHHRA, without correction, should be incorporated into the CWM-CS document. It should be noted that the calculated carcinogenic risks to subsistence fishermen was 6E-08 to 7E-07 in the SHHRA, Table 4. These levels are generally not of concern.

It is requested that the Agency furnish the language that is intended to be included in any "disclaimer" to the report regarding risk assessment. Further, is it the Agency's intention to include the SHHRA furnished with the June 3, 1994 letter in the disclaimer?

- **Agency Comment:** In Item No. 2 of your letter, you state that U.S. EPA has ignored analytical data collected on surface water and sediments and has reached significant conclusions concerning the project by relying on flux calculations. CWMCS stated that flux calculations for contaminant discharges into Lake Calumet were useful to help determine where samples should be collected.

  U.S. EPA has not ignored surface water and sediment analytical data obtained during the RFI. CWMCS seems to have misinterpreted paragraph 3 of the June 3, 1994 letter. Paragraph 3 stated that U.S. EPA reached a conclusion after all of the information in the REPORT, including flux calculations and comparison of class II groundwater protection standards to onsite groundwater contamination levels, was evaluated and considered.

  CWMCS' response is inconsistent with the agreement reached between U.S. EPA and CWMCS before preparation of the draft RFI report. Under that agreement, flux calculations were considered necessary to demonstrate the effect that groundwater contamination may have on human health and the environment. In fact, in the draft RFI report, CWMCS proposed that modeling and flux calculations be used to establish alternative groundwater concentration levels.

  Finally, contrary to what is stated, these flux calculations were not voluntarily performed by CWMCS to determine where samples should be collected at the CWMCS facility. Rather, CWMCS agreed to perform these calculations after being requested to do so by U.S. EPA. U.S. EPA and CWMCS have used modeling techniques to calculate the contaminant fluxes. These calculations are based on groundwater analytical data and hydrogeologic data obtained by CWMCS during the RFI. However, because contaminants discharging to the lake are infinitely diluted, the organics measured in surface water are mostly nondetectable. This finding is not at all surprising. On the other hand, both CWMCS and U.S. EPA calculations indicate that contaminants are discharged to the Lake. CWMCS has failed to address the large number and concentrations of contaminants detected in groundwater that discharge to the Lake based on the facility's hydrogeologic conditions. These contaminant discharges should be addressed in the CMS.

  CWM-CS Response: Essentially, the workplan prepared for this project relied upon collection of environmental samples. Samples were subjected to rigorous analytical QA/QC procedures and data was validated. The Agency recognizes that the results are mostly nondetectable and concludes that contaminants discharging to the lake are infinitely diluted.

In the absence of detectable impacts, modelling is utilized by the Agency to demonstrate the effect that groundwater contamination may have on human health and the environment.

This issue must be dealt with in additional detail. However, two important points must be considered. The first, the facility investigation proceeded in two phases. The first phase was a broad facility wide investigation followed by the second phase which focused on potential areas of concern. The second phase involved collection of samples immediately adjacent to the pier. Secondly, the Agency's consultant concluded in Section 3.1.1 of the SHHRA that:

> "These receptors may also be exposed to contaminated surface water. This potential exposure pathway was not evaluated primarily because very little contamination was detected in surface water during the RFI (CWMCS 1993)."

This issue is being further reviewed in preparation of a detailed response. A complete response will require an additional 30 days.

CWM-CS RESPONSE - 2-24-95 Addenda: After further review of this issue, CWM-CS's previous response (see the August 1994 responses to USEPA comments, Attachment I., item 24.) addresses the Agency's concerns. Both the Agency's letter of January 5, 1995 and the SHHRA prepared by the Agency support CWM-CS's position.

The following are U.S. EPA's responses to some of the critical items in Attachment 1 of your RESPONSE:

Part 1

- **Agency Comment:** Item No. 1 concludes, "The presence of continuous or discontinuous sand seams in the lower lacustrine layer is not significant. The lower lacustrine unit is separated from the contaminated fill unit by the upper lacustrine unit. This unit is a homogeneous silty clay soil unit approximately 10 feet thick, in which no contaminants were measured in all soil specimens collected from this layer. Consequently, the unit behaves as a barrier to the migration of contaminants".

  U.S. EPA does not believe that CWMCS has provided enough data to conclusively support the hypothesis that sand seams are discontinuous. However, to prevent any further delay in finalizing the RFI Report, the issues regarding whether the sand seams encountered during these investigations are discontinuous should be deferred. CWMCS could state in the RFI Report that both the U.S. EPA and CWMCS disagree on the status of the sand seams encountered during the RFI.

CWM-CS Response: This issue has been discussed on numerous occasions. It remains the opinion of Dames and Moore that the sand seams are discontinuous. Information concerning this subject is being reviewed and will be resubmitted to the Agency within 30 days.

CWM-CS Response - 2-24-95 Addenda: This issue is significant and critical to the finalization of the Investigation Report. Referencing CWM-CS's August 19, 1994 letter to the Agency (specifically Attachment 1, Part 1, Comment 1) a detailed discussion of the sand seam issue is provided. The response summarizes past Agency comments and CWM-CS responses to previously raised questions. Given the volume of information that has been generated, the Agency's observation that "U.S.EPA does not believe that CWMCS has provided enough data to conclusively support the hypothesis that sand seams are discontinuous" is non-specific given the amount of time the Agency has devoted to this issue.

- **Agency Comment:** In Items 3a, 3c and 25, your responses indicate that the potentiometric surface maps correctly depict groundwater elevations in the vicinity of the vault and that the vault liner is a barrier preventing migration of leachate from the vault or infiltration of groundwater into the vault. Also, CWMCS does not agree that contaminants in monitoring wells G-302 and G-336 originate from the vault but from solid waste management unit SWMU #6.

  First, no as-built drawings of the vault are available to show how this vault was constructed. Second, the contaminants in wells G-302 and G-336 are likely the result of preferential migration of contaminants from the vault to the lake. CWMCS implies that similar contamination should have been found in well G-318, but this is not necessarily true because the vault's clay liner may be effectively containing migration in the direction of that well. U.S. EPA believes that the vault's integrity is questionable because of contaminants detected in adjacent downgradient wells G-302 and G-336, and because no construction records or data for the hydraulic head within the vault are available to substantiate CWMCS's statements. The vault may be reducing contaminant migration to the lake, but it does not prevent migration to the lake. As stated in CWMCS' response, leachate may have been generated from infiltrating precipitation, which implies that the vault's cap is permeable. The vault's sidewalls and bottom may also be permeable in certain locations, causing contaminants to slowly and erratically migrate toward monitoring wells G-302 and G-336. The vault area should be addressed in the CMS for the facility.

  CWM-CS Response: Previous responses on this issue are being reviewed. To thoroughly respond to this issue, an additional 30 days will be required.

CWM-CS Response - 2-24-95 Addendum: Extensive investigation of the vault area was undertaken and a differences of opinion exists between CWM-CS and the Agency. Regardless of whether or not the vault is intact, the vault area is a SWMU (the former wastewater basin #1) and would be subject to the CMS, if required.

- **Agency Comment:** In Item No. 4, you state that after re-evaluating groundwater results, it was determined that inorganic compounds, including metals, do not indicate a contaminant distribution pattern. CWMCS states that it is impossible to determine if the onsite SWMUs or fill material are the sources of metals in the groundwater. CWMCS also states that the reason metals are not useful in identifying a contaminant distribution can be seen by comparing sample results from phase I and phase II.

  U.S. EPA disagrees that inorganic compounds, including metals, do not indicate a contaminant distribution. U.S. EPA also evaluated all of the phase II groundwater sampling results in the REPORT, including soil sample results. A contaminant distribution pattern is still evident. The phase I sampling results were not evaluated because CWMCS has always insisted that the phase I results were unreliable.

  CWM-CS Response: An additional 30 days is required to further consider this issue and provide an adequate response.

  CWM-CS Response - 2-24-95 Addendum: The Agency insists that a contaminant distribution pattern is evident. Without additional information on the issue, CWM-CS cannot review the Agency's conclusions.

- **Agency Comment:** The response in Item No. 5, indicates that contamination detected in well G-349 is from an upgradient source rather than from one of the SWMUs investigated during the RFI. CWMCS is responsible for investigating the extent of contamination at the facility, and CWMCS should investigate whether a SWMU or other source on the facility caused this contamination. This source should be addressed in the CMS.

  CWM-CS Response: The responsibility to investigate the facility upgradient from the former G-349 well location is being evaluated. This effort will require an additional 30 days.

CWM-CS Response - 2-24-95 Addendum: The former well location, G-349, is located close to the facility's southern and eastern property lines. Identified SWMUs are generally downgradient from this location. If a CMS is warranted, this area will be further considered.

- **Agency Comment:** In Item No. 7, CWMCS states that groundwater sample results for wells located between the SWMUs and the lake do not support U.S. EPA's belief that groundwater moving through the fill is contaminating the lake. U.S. EPA does not agree. Evaluation of the RFI data indicates that contaminants detected at various monitoring wells screened adjacent to the lake and within the source areas of the facility migrate slowly from the facility to the lake. The contaminants are diluted in the lake but continue to deteriorate the lake's water quality.

  CWM-CS Response: The facility's approved workplan relied upon collection and analysis of Lake Calumet samples to establish the quality of Lake Calumet water.

- **Agency Comment:** In Items 8, 10 and 24, your responses are seemingly opine that U.S. EPA's flux calculations are simplistic and unrealistic. CWMCS also states that its calculation of contaminant fluxes using a "next-level-of-sophistication" model results in estimates of discharges that are one order of magnitude lower than those calculated by U.S. EPA.

  U.S. EPA's calculations were intended to be simple in order to demonstrate the effect of facility contamination on the environment and to provide examples (such as for benzene, 1,1-dichloroethene, and vinyl chloride at three well locations) of the calculations that the RFI report lacked. U.S. EPA's calculations are realistic given the RFI data and the hydrogeologic conditions at the facility. CWMCS's complex model is, in fact, unrealistic given the facility conditions, and it yields results for the mass rate of discharge of benzene identical to those of U.S. EPA's simpler calculations. U.S. EPA and CWMCS benzene flux results differ by an order of magnitude only because U.S. EPA's assumed area of contaminant discharge is an order of magnitude larger than CWMCS's. Even if an order of magnitude difference exists between the results of these calculations, it is not surprising given the variable hydrogeological data presented in the RFI report. In any case, U.S. EPA and CWMCS flux calculations both indicate that contaminants discharge to the lake, thus degrading the lake's water quality, but CWMCS has not addressed discharges of the multitude of contaminants detected at high concentrations (relative to applicable groundwater protection standards) throughout the facility. These contaminant discharges should be addressed in the CMS.

CWM-CS Response: An additional thirty (30) days is required to prepare a response to this issue.

CWM-CS Response - 2-24-95 Addendum: CWM-CS reiterates that previous responses have addressed the Agency's comments. (see responses to Agency comments, Attachment I, item 24.)

- **Agency Comment:** The response in item No. 26 does not address U.S. EPA's comment. The sentence "This contaminant distribution pattern of the fill sample is a reflection of groundwater sample results" should be rewritten as follows: The groundwater sampling results are a reflection of the contaminant distribution pattern in the soils and SWMUs at the facility.

CWM-CS Response: Additional time is required to respond. A response will be prepared within thirty (30) days.

CWM-CS Response - 2-24-95 Addendum: CWM-CS reiterates that the response to item No. 26 as presented in Attachment I in the August responses addresses the Agency's comment.

- **Agency Comment:** Your response in Item No. 27 did not adequately address U.S. EPA's comment. CWMCS claimed that these polynuclear aromatic hydrocarbons (PAHs) are ubiquitous. On page 23, paragraph 4, the text of Attachment I indicates that the major sources of PAHs contamination are wind, scouring of the lake, and sediment transport by wave action. On page 21, paragraph 4, the text indicates that contaminants in sediments at sampling location S-1 are the result of precipitation runoff and industrial activities in the Lake Calumet area. These explanations are reasonable when applied to the entire area, but PAH contamination in sediments adjacent to the facility is more likely the result of runoff from waste management areas within the CWMCS facility. The contaminated sediments in close proximity to the CWMCS facility must be addressed regardless of whether these contaminants resulted from precipitation runoff. PAHs contaminants identified in the sediment samples also occur in high concentrations in the leachate samples collected from the onsite vault.

U.S. EPA has also compared the dry weight of the parameters found in the sediment sample at S-1 to conservative/screening benchmarks to determine if there is any potential for adverse ecological effects due to these sediment contaminants.

The benchmark shown in the table (Attachment 1), are the lowest effect level (LEL) from the "Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario (Persaud, et al.). The effects range median (ER-M) is from the National Oceanic and Atmospheric Administration (NOAA) Technical Memorandum NOS OMA 52 (Long and Morgan), and U.S. EPA sediment quality criteria (SQC).

The dry weight ($\mu g/g$) of each parameter has been converted to the organic carbon normalized concentration ($\mu g/g_{oc}$) to facilitate comparison with the SQC benchmarks. Since no total organic carbon (TOC) value was provided with the data, the TOC was assumed to be 3% for the calculations done here. The conversion is:

$$\mu g/g \div (\%\ TOC \div 100) = \mu g/g_{oc}$$

$$10.1\ \mu g\ \text{Phenanthrene}/g \div (3 \div 100) = 336\ \mu g/g_{oc}$$

At sampling location S-1, all of the polycyclic aromatic hydrocarbons (PoAHs) exceed the benchmarks for individual PoAHs and total PoAH. Phenanthrene exceeds the U.S. EPA sediment quality criteria. Based upon this review, further evaluation of the sediments in the proximity of sampling site S-1 is warranted to determine the level of risk to ecological receptors in the vicinity of the site.

Finally, U.S. EPA re-evaluated your response to your conclusion regarding the absence of "any discernable immiscible or dissolved contaminant plumes" originating from the CWMCS facility. We conclude that your claim is incorrect. Volume 3, Appendix L of the RFI REPORT shows that two major dissolved groundwater plumes have existed for various volatile organic compounds (VOC) during both phases of the RFI. One of these plumes encompasses the former biobed area and the Hyon tank farm area. The second plume emanates from the wastewater basin west of the vault, which may be indicative of contamination emanating from the leachate vault. The dissolved VOC plumes depicted in Appendix L include organic compounds such as benzene, 1, 1-dichloroethene, phenol, 2,4-dichlorophenol and the semivolatile compound naphthalene. In addition, a dissolved arsenic plume is also evident for phase 1. Other plumes are also likely to exist, because the number of organic compounds detected in the onsite groundwater monitoring wells and soils is greater than the number of compounds depicted in Appendix L.

In addition, immiscible contamination such as floating oil and solvent mixtures was observed during field sampling at various locations, particularly adjacent and west of the leachate vault and in the biobed area. Evaluation of the RFI data indicates that these plumes slowly discharge to Lake Calumet and therefore degrade the water quality in the long term.

Therefore, corrective measures to alleviate contaminant discharges to the Lake are necessary and must be addressed in the CMS.

CWM-CS Response: An additional thirty (30) days is required to respond to this issue.

CWM-CS Response - 2-24-95 Addendum: Part 1, Section 4.4, Surface Water and Sediment Analytical Results, Final RCRA Facility Investigation Report submitted to the Agency in November 1993, provides information on the sediment quality throughout Lake Calumet. The Basis for CWM-CS's conclusions concerning the quality of Lake Calumet are based upon independent studies of Lake Calumet are based upon independent studies of Lake Calumet by the authors referenced in the REPORT.

Sediment quality issues are addressed in the Ecological Risk Assessment (ERA). Management of sediment quality data should be discussed in the context of the ERA.

The Agency's original comment, contained in the Agency's June 3, 1994 letter relates to Page 105, Section 4.4 of the Final RCRA Facility Investigation Report submitted to the Agency in November 1993. It must be noted that Section 4.4 is entitled ***Surface Water and Sediment Analytical Results.*** This section discusses the surface water and sediment analytical results. Therefore the conclusions contained within this section concern surface water and sediment issues. In light of this information, CWM-CS believes that the Agency should reconsider the conclusion concerning the correctness of CWM-CS's observations.

CWM-CS has contacted individuals involved in not only this investigation but employed by the facility for years. There is no recollection of immiscible contamination visible on the waters of Lake Calumet. Similarly, no immiscible materials were observed on any samples collected in the referenced areas during the RFI investigation. Regardless, most immiscible materials have solubilities such that the materials would be detected by the analytical program associated with this project.

- **Agency Comment:** The response in Item 28 seems to imply that there are risks from Lake Calumet to recreational users and from fish ingestion. However, dermal absorption or incidental ingestion and fish ingestion are not viable pathways. CWMCS has not clearly defined these risks from Lake Calumet or the source(s) and the appropriate pathways associated with these risks. More importantly, CWMCS must explain any correlation between these risks and the management of hazardous waste at the facility, if any. It has been documented in the REPORT that the groundwater in the fill is highly contaminated and the majority of the hazardous constituents in the groundwater are expected to be released to the Lake. U.S. EPA also is aware that it may be difficult to quantify risk from fish ingestion due to the industrial activities within the Lake area.

CWM-CS Response: "Fishermen have been observed fishing in Lake Calumet near the CWMCS Incinerator facility. These fishermen may come in contact with contaminated sediments while standing on the edge of the lake or as a result of wading into the lake. These receptors may also be exposed to contaminated surface water. This potential exposure pathway was not evaluated primarily because very little contamination was detected in surface water during the RFI (CWMCS 1993). Fishermen may also be exposed via ingestion of contaminated aquatic life. However, this potential exposure pathway was not evaluated for two reasons. First, very little contamination was detected in surface water as discussed above. Second, although sediments are contaminated, any attempt to model the transfer of contamination from sediments to aquatic life would involve significant uncertainties." The paragraph is a direct quotation from the SHHRA (Section 3.1.1.) prepared by U.S.EPA's consultant. CWM-CS is hopeful that this responds to the Agency's question.

<u>Part 3</u>

- **Agency Comment:** In Item No. 1, the response states that U.S. EPA's conclusion that it is necessary and practical to restore damaged areas to original condition or as close as possible is irresponsible and unsupported by a technical justification particularly without the benefit of a CMS. To reiterate, the purpose of the RFI is to determine the nature and extent of releases of hazardous waste or hazardous constituents from regulated units, SWMUs and other source areas at the CWMCS facility, and to gather all necessary data to support a CMS and if necessary to remedy these releases. The data and conclusions, as established in the REPORT, to a large extent corroborate and support U.S. EPA's position that the groundwater and soils at the CWMCS facility are highly contaminated and, as such, must be remediated. In addition, soil samples adjacent to the facility were also analyzed and found to contain hazardous constituents. The CMS should now contemplate proposals to remedy these releases. It is not irresponsible to require CWMCS to remedy these releases. Section 3008(h) clearly authorizes U.S. EPA to require corrective action or any other response necessary for any releases of hazardous waste from a facility to protect human health and the environment.

  CWM-CS Response: CWM-CS's original response is as follows and remains appropriate and applicable:

"Facility environmental investigations require consideration of issues beyond the facility boundaries. Consideration of the potential impacts from local landfills and 100 years of industrial activity within the Lake Calumet area are necessary to determine impacts of these activities on the facility.

The Agency's conclusion that 'it is necessary and practical to restore this damaged area to original condition or as close as possible' is irresponsible and unsupported by a technical justification at this time, particularly without the benefit of a CMS."

- **Agency Comment:** The response in Item No. 2 does not address U.S. EPA's comment. U.S. EPA requested that the CMS consider soil cleanup levels protective of groundwater quality standards found in 35 Illinois Administrative Code (IAC) Subpart B, Sections 620.10 and 620.20. However, CWMCS's response does not address this issue. In addition, on-site monitoring well data should be compared to Class II groundwater protection standards and upgradient monitoring well data to establish whether significant contaminant releases from the facility to groundwater have taken place.

  CWM-CS Response: An additional thirty (30) days is required to respond to this issue.

  CWM-CS Response - 2-24-95 Addendum: The Illinois Administrative Code (IAC) has been reviewed again. The Illinois Groundwater Quality Standards (IAC, Title 35-Environmental Protection, Subtitle F-Public Water Supplies, Chapter I - Pollution Control Board; Adopted effective November 25, 1991; Amended effective September 11, 1992) as published by the Bureau of National Affairs, Inc. does not appear to have a Subpart B, Section 620.10 or 620.20. CWM-CS believes that the IAC references to 35 IAC 620.420 is correct.

The following are U.S. EPA's responses to Attachment II in your RESPONSE:

Agency Comment: In item No. 6, U.S.EPA acknowledges the existence of Occupational Safety and Health Administration (OSHA) rules and regulations that require the use of personal protective equipment (PPE) to limit or prevent exposure to hazardous contamination. U.S. EPA does not condone or encourage any violations of these rules and regulations. However, in almost any industrial situation instances may arise in which PPE is not used or PPE is damaged, resulting in exposure to contamination. At a minimum, the baseline RA report should acknowledge that the use of PPE is not foolproof and that exposure to contamination may occur despite attempts to follow OSHA rules and regulations.

CWM-CS Response: Originally the Agency stated (June 3, 1994 letter):

".... and (2) consider exposure that may result if workers fail to adhere to administrative controls such as personal protective equipment requirements; this would be the case at a typical construction site."

The SHHRA prepared by PRC Environmental Management for U.S.EPA assumes that engineering controls are not in place and workers do not use PPE. The Agency should further consider the implications of this issue.

- **Agency Comment:** In response to Item No. 11, Section 5.7.4 of U.S. EPA's *Risk Assessment Guidance for Superfund* (RAGS) indicates that, in general, anthropogenic background chemicals should not be eliminated from the baseline RA because it is extremely difficult at the baseline RA stage to conclusively show that such chemicals (in this case, trichloroethene) are not related to the facility or the surrounding area. Furthermore, trichloroethene was detected in surface soil. It is difficult to imagine how trichloroethene, a volatile organic compound, migrated onto the facility solely from an off-site location and remained on the facility at a concentration high enough to be detected during sampling. The presence of trichloroethene in the surface soil suggests a more immediate and localized source of the contamination. Because the presence of trichloroethene in the surface soil at the facility cannot be attributed solely to off-site sources, the baseline RA report should justify the exclusion of trichloroethene as a contaminant of potential concern based on anthropogenic considerations.

CWM-CS Response: To fully evaluate this issue an additional thirty (30) days is required to prepare a response.

CWM-CS Response - 2-24-95 Addendum: The following text was added to the HHRA: "Given that the area surrounding the CWMCS facility has historically been a heavily industrialized area, anthropogenic contamination of a variety of organic chemicals is expected,m especially given the heterogeneous fill material used to create land surfaces around Lake Calumet. Numerous past and current sources of TCE other than the CWMCS facility are likely. In this case, use of statistical comparison to eliminate compounds not detected in facility samples at levels significantly higher than baseline levels is appropriate. Furthermore, the addition of TCE as a COPC would not alter risk estimates, since EPA has withdrawn all toxicity values for TCE from IRIS. Risks associated with exposure to TCE cannot be evaluated quantitatively."

- **Agency Comment:** In Item No. 31, your response misses the point of U.S. EPA's original comment. The comment was not referring to resuspension of dust from workers' skin and subsequent inhalation; rather, the comment was referring to the possibility that some of the contaminated dust could be inhaled at the same time that the dust is being deposited on workers' skin. Specifically, the baseline RA report should evaluate the potential for total exposure to fugitive dusts. Also, the baseline RA is supposed to consider reasonable maximum exposure (RME) conditions. Under such conditions, it is reasonable to assume that hygiene practices are not completely followed. Many industrial workers who work out of doors do not have well washed their hands; thus these workers may be exposed to contaminated soil via incidental ingestion of soil. The baseline RA should evaluate the potential for exposure to contaminated soil via incidental ingestion.

  CWM-CS Response: Wording of U.S.EPA's original comment was misinterpreted. Please reference the tables 5-3, 5-4, 5-5 and 5-6 of the Human Health Risk Assessment for the required information.

The following are U.S. EPA's comments to Attachment III in your RESPONSE:

- **Agency Comment:** In Item 1, you stated that it is outside the scope of the ERA report to compare the contaminants detected in surface water and sediment samples to those detected in samples collected at the facility. Because the source of pollutants in Lake Calumet is pertinent to the ERA and because the ERA report discusses the possibility that other sources are responsible for the contamination, some reference to on-site sample results is needed. Although a detailed discussion may not be necessary, at a minimum the ERA report should state whether some or all of the contaminants were also detected at the facility and should refer to another part of the RFI report where this comparison is made.

  CWM-CS Response: An additional thirty (30) days are required to prepare a response to this issue.

  CWM-CS Response - 2-24-95 Addendum: The following text was added to the ERA: "The following COPCs detected in sediments were also detected in facility soils: antimony, beryllium, chromium, lead, mercury, zinc, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, methylene chloride, phenanthrene, and pyrene. While it is possible that the presence of some of these contaminants could have resulted from releases from the facility, it is important to keep in mind that numerous other sources of PAH releases into Lake Calumet have been identified. For example, samples taken from various landfill sites around Lake Calumet contained elevated levels of heavy metals and polycyclic aromatic hydrocarbons (PAHs) (IDENR, 1988). According to IDENR (1988), priority pollutants most likely to occur in Lake Calumet sediments include arsenic, cadmium, chromium, copper, lead, nickel, selenium, silver, zinc, DDT, dieldrin, PCBs, di-n-butyl phthalate, and PAHs."

- **Agency Comment:** In Item No. 2, you stated that a survey conducted by Dames & Moore on September 27, 1993, will be referenced to support the conclusion that no threatened or endangered plant and animal species are present at the facility. This response partly addresses U.S. EPA's comment, but additional information is needed to substantiate CWMCS's conclusion. Information on specific areas at the facility, the methods used to conduct plant and animal surveys, and the conditions at the facility during the surveys (including weather conditions and other types of activities that were being conducted, and so on) should be provided.

  CWM-CS Response: The "survey" conducted by Dames & Moore on September 27, 1993, consisted of personal observations made by field biologists during a brief site visit. Formal plant and animals surveys were not done, but notes based on species that occurred on or near the facility at that time were made. These observations can be used to substantiate the judgment that no T & E species were present at the facility at that time.

- **Agency Comment:** In addition, other supporting references are needed to determine whether threatened or endangered species (state-listed as well as federally designated) occur at the facility. The local office of the U.S. Fish and Wildlife Service (FWS) was contacted for information. However, because the information that FWS offers may be limited, a review of the Illinois natural heritage database should be requested to supplement the information already obtained. Also, a single survey performed on a single day is not sufficient to demonstrate the absence of bird species. Because bird counts are done annually in the vicinity of the facility, the Chicago Audubon Society should be contacted for additional information about sightings of threatened or endangered bird species at the facility and in areas adjacent to Lake Calumet. The assumption that threatened or endangered species will not use the facility or surrounding areas may be inaccurate given the high concentrations of birds that are known to pass through the Lake Calumet area.

CWM-CS Response: The Illinois Natural Heritage Database was examined. Deanna Glosser, Endangered Species Protection Manager of the Illinois Department of Conservation searched the Illinois Natural Heritage Database and provided Dames & Moore with a written record of her findings in a letter dated October 6, 1993. Information provided by Ms. Glosser is summarized in Section 3.1.2 and Table 3-1 of the ERA. Of the 13 Illinois state-listed T & E bird species that could potentially occur in the Lake Calumet area, five (yellow rail, black-crowned night heron, American bittern, red-shouldered hawk, and northern harrier) have been observed in the Lake Calumet area. No federally-listed T & E species occur in the immediate vicinity of the facility. Although the Chicago Audubon Society does provide data on annual bird counts, it is doubtful the (1) additional bird species other than those listed in the National heritage Database as occurring in the area would be added to that group; and (2) that any of these species nest or spend a substantial amount of time on facility property.

The ERA did not assume that "T & E species will not use the facility or surrounding areas...." We acknowledge that some T & E bird species may land on, use, and feed on or from the facility but are not likely to nest or spend substantial amounts of time on facility property. Most of the T & E birds species are associated with wetland areas, and no wetlands exist on facility property. The CWM-CS facility consists of an artificial pier inhabited primarily by invader and early successional species.

- **Agency Comment:** In Item No. 4, you provided additional information about threatened or endangered species in the area of the CWMCS facility. However, the first paragraph of the response does not fully address U.S. EPA's comment concerning breeding bird populations. The phrase "or potentially occur" should be deleted from the first sentence because the black-crowned night heron, a state-listed endangered species, is known to nest in the area. In addition, the habits of nearby nesting bird populations should be researched to substantiate the claim that no bird populations should be researched to substantiate the claim that no bird species spend a significant amount of time at or near the facility. Finally, the response addresses only wintering bird populations and does not identify additional species that nest in the area and that forage in Lake Calumet near the facility. The Chicago Audubon Society may be able to provide the missing information.

The response also discusses candidate endangered species known to occur within 5 miles of the facility. The response mentions that five avian species have been observed in the area, but it lists only three of them. The other two avian species should be identified, and the specific locations of all sightings should be researched so that the proximity of the avian species to the facility can be determined.

CWM-CS Response: It is correct that the black crown night heron does nest in the area. However, individuals of this species are not expected to be exposed to facility related contaminants for the reasons outlined in the REPORT.

Although the species listed in Table 3-1 may represent "only wintering bird populations," this list is considered complete in that it includes information gathered from the Illinois Natural Heritage Database and the Fish and Wildlife Services. Again, although he Chicago Audubon Society does conduct annual bird counts information on T & E species that may occur in the area obtained from two reliable sources, originally recommended by U.S.EPA, is considered complete.

The five avian species known to occur within five miles of the facility are: yellow rail, black-crowned night heron, American Bittern, red-shouldered hawk, and northern harrier.

Appendix C

Response to May 3, 1995 USEPA Comments

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY MAY 8 1995
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF:

MAY 03 1995

HRE-8J

Mr. Kevin K. Hersey
CWM Chemical Services, Inc.
3001 Butterfield Road
Oakbrook, Illinois 60521

Re: Final CMS determination
CWM Chemical Services Inc.
ILD 000 672 121

Dear Mr. Hersey:

The United States Environmental Protection Agency (U.S. EPA) is in receipt of your March 27, 1995, letter concerning the facility at 11700 South Stony Island, Chicago, Illinois. This letter was in response to U.S. EPA's February 27, 1995 preliminary written determination that a Corrective Measures Study (CMS) is required at the CWM Chemical Services, Inc. (CWMCS) facility pursuant to Section IV, Part (H) of the 1988 Consent Judgement (CJ).

On March 6, 1995, U.S. EPA received CWMCS's Final RCRA Facility Investigation Report (RFI). U.S. EPA has completed reviews of the final RFI report and your response to the preliminary written determination for a CMS. As per a January 5, 1995, letter and attachment, U.S. EPA continues to hold its same position that CWMCS' final RFI report is deficient in several areas. The final RFI report was not revised as required by the CJ. U.S. EPA disagrees with a significant portion of the RFI report. Pursuant to section IV, Paragraph (I) of the CJ, U.S. EPA is required to make a final written determination as to whether a CMS is required at the CWMCS facility and provide a copy of this written determination to CWMCS. Based upon the information of record, U.S. EPA has determined that a CMS must be performed at the above-mentioned facility.

In your March 27, 1995, response, you have identified four issues you believe are relevant to a CMS determination. By this letter, and the enclosed attachment, U.S. EPA is providing the basis for making a determination that a CMS is necessary at the CMS facility pursuant to Section IV, Paragraph (I) of the CJ. U.S. EPA also hereby responds to the four issues in your March 27, 1995, letter that you have identified as relevant to the CMS determination. Finally, this constitutes U.S. EPA's final written determination that a CMS is necessary at the CWMCS facility located on 11700 South Stony Island, Chicago, Illinois.

If you have any questions regarding this matter please contact Mr. Jonathan Adenuga of my staff at (312) 886-7954.

Sincerely yours,

Joseph M. Boyle

Joseph M. Boyle, Chief
RCRA Enforcement Branch

cc: Kostas Dovantzis, PRC

ATTACHMENT 1

FINAL DETERMINATION REGARDING THE NEED FOR A CORRECTIVE MEASURES STUDY CHEMICAL WASTE MANAGEMENT - CHEMICAL SERVICES, INC. CHICAGO INCINERATOR FACILITY

SAND SEAMS ISSUE

CWMCS states that the information submitted to EPA indicates that sand seams in the upper and lower lacustrine layers are discontinuous and that the focus of the CMS will be on the unconsolidated unit overlying the upper lacustrine layer. Given the depth and frequency of contaminant occurrence, it may be appropriate to focus the CMS on the unconsolidated unit. As was indicated in U.S. EPA's January 5, 1994, letter, the issue regarding whether sand seams in the lower lacustrine layer are discontinuous should be deferred. It is also well documented in the Final RFI report that migration pathways to the lake exist, and that the upper lacustrine layer, the unconsolidated unit, and groundwater beneath the facility are contaminated with metals, volatile organic compounds (VOCs), and semi volatile organic compounds (SVOCs). In addition to the migration pathways and contaminants, adjacent lake sediments are also contaminated. As long as these contaminated media and **all** migration pathways to the Lake are addressed in the CMS, the issue of discontinuous sand seams in any of the geologic units beneath the CWMCS facility will become moot.

RISK ASSESSMENT ISSUE

In your response, you indicate that CWMCS submitted a Human Health Risk Assessment (HHRA) as an appendix to the RFI report and that in lieu of commenting on the HHRA report, U.S. EPA directed its consultant to prepare a supplemental HHRA (SHHRA). You further state that U.S. EPA demanded that the SHHRA information be incorporated without correction into the RFI report and that, to this date, U.S. EPA failed to identify the serious shortcoming, when in fact it has. CWMCS also states that it recommends that the SHHRA be withdrawn because U.S. EPA assumed in the SHHRA that commonly employed personal protective equipment (PPE) would not be employed at the facility.

Your description of the chronology of events regarding the risk assessment issue is inaccurate and unresponsive to the actual record of events, which includes your response to U.S. EPA's comments on CWMCS base line Risk Assessment (RA)). In U.S. EPA's March 1, 1991, letter to CWMCS, item 4 specifically requested that CWMCS conduct a full-fledged risk and environmental assessment that is consistent with Task III.D of the Scopes of Work, Attachment A of the C.J. The CWMCS RA report was submitted to U.S.EPA on December 6, 1993. CWMCS also requested that this RA report be considered as draft because CWMCS has identified several inconsistencies in its own report and data.

Prior to the U.S. EPA's June 3, 1994, letter and comments on CWMCS RA report, and based on reviews of the hard-copy and digitized CWMCS's RA data, U.S. EPA identified two potential receptors (i.e. remediation onsite workers and subsistence fishermen) that were not evaluated in the CWMCS RA. U.S. EPA had previously notified CWMCS of these deficiencies during a December 29, 1993, telephone conversation. During that conversation, CWMCS indicated that these potential receptors were not necessary and should not be included in the RA. U.S. EPA disagreed with CWMCS's position on this issue. CWMCS was then informed that U.S. EPA will be evaluating the risk to these two potential receptors and the results would be incorporated in the RA.

Consistent with U.S. EPA's policy regarding conducting full-fledged risk assessments, U.S. EPA supplemented the CWMCS risk data in the RA report, after CWMCS declined to evaluate risks to the above-mentioned two potential receptors. U.S. EPA prepared an additional risk assessment to compensate for the deficient and incomplete RA. Based on the findings of the SHHRA, construction and utility workers are assumed to be exposed to a significant carcinogenic risk (in excess of 10^{-4}) in the eastern fenced area of the facility that includes the former biobed area; and remediation workers can be assumed to employ PPE because their work must be performed in accordance with a health and safety plan (HSP). However, it is not commonly assumed that typical construction and utility workers wear PPE for routine underground construction or repair activities. Therefore, the SHHRA must remain an integral part of the HHRA and the final RFI report.

Finally, your August 19, 1994, response to U.S. EPA's June 3, 1994, comments on the CWMCS RA report clearly indicate that U.S. EPA prepare the SHHRA only after furnishing comments on the CWMCS HHRA. Attachment II of the August response refers to U.S. EPA's comments on these two potential receptors that were not evaluated in the CWMCS baseline HHRA.

SURFACE WATER and SEDIMENT IMPACT ISSUE

CWMCS states that very little contamination was found in surface water and that no significant risk may exist from exposure to sediment under the exposure scenarios considered in the SHHRA. CWMCS further states that surface water and sediment are outside of the scope of the CMS.

U.S. EPA has re-evaluated the CWMCS's Final RFI report and your response to the preliminary determination. We agree with the general concept of focusing the CMS on contaminated soils and groundwater within the pier. However, this idea does not preclude the need to remediate contaminated sediments, which likely resulted from hazardous waste management activities at the CWMCS facility. As was indicated in the table (Attachment II) of January 5, 1994, comment letter, Polycyclic Aromatic Hydrocarbons (PAHs) in sediments of sampling location S-1 identified in the Final RFI report (Table 4-36) exceed the benchmarks for individual and total PAHs as established in the "Guidance for Protection and Management of Aquatic Sediment Quality in Ontario" and "National Oceanic & Atmospheric Administration" and U.S. EPA Sediment Quality Criteria. Your explanation of the ubiquitous nature of PAHs are reasonable when applied to the entire Lake Calumet region. However, Contaminated sediments, in close proximity to the facility, most likely resulted from waste management areas within the facility. The CMS portion addressing surface water and sediments should focus on remediating only those contaminated sediments that have been identified during the RFI. In addition, the following items below support U.S. EPA's position that these sediments and the Lake waters must be protected from further degradation:

- Multitude of contaminants detected in the groundwater continues to discharge to the Lake based on the facility's hydrogeologic conditions;

- Two major dissolved groundwater plumes exist for various volatile organic compounds (VOCs). The dissolved VOC plumes such as benzene, 1,1-dichloroethene, phenol, 2,4-dichlorophenol and semi-VOC naphthalene slowly discharge to the lake and degrade the lake water quality long term and degrade the sediment quality short term;

- Though diluted in the lake water U.S. EPA's and CWMCS's flux calculations show that contaminants discharge to the lake, thus degrading lake water quality and;

- The integrity of the onsite vault liner as a barrier preventing migration of leachate from the vault to the lake or infiltration of groundwater into the vault is questionable.

VAULT, G-349 and OTHER AREAS

CWMCS states that the CMS should address the entire facility using a single or multiple options.

U.S. EPA agrees that a single or multiple remediation alternatives may be appropriate for the entire facility as long as all contaminated areas and media are adequately addressed.

Soil and groundwater contamination should be addressed for all solid waste management units investigated during the RFI, including but not limited to the vault, monitoring well G-349, former biobeds, and the Hyon tank farm area.

In summary, based on the results presented in the final RFI report, EPA's evaluation of that report, and the foregoing discussion, the scope of the CMS should address contaminated soils and groundwater in the unconsolidated unit overlying the upper lacustrine layer. As shown in Part 1, Sections 4.2 and 4.3, and Part 3 of the final RFI report, soil and groundwater contamination in this unit exceeds both background levels and applicable regulatory levels for protection of Class II groundwater in the State of Illinois. In addition, as shown in Part 1, Section 4.2, and as determined by EPA's evaluation of the final RFI data, groundwater in the unconsolidated unit is hydraulically connected to and discharges a multitude of contaminants to Lake Calumet. Therefore, soil and groundwater, including contaminated sediments, remediation should be addressed in the CMS for all relevant areas. Institutional controls restricting underground construction and utility work as discussed above should be an integral part of correction measures for the facility.

Responses to the comments made by USEPA in letters to CWM dated January 5, 1995 and May 3, 1995

USEPA Comment: Sand Seams Issue

CWMCS states that the information submitted to EPA indicates that sand seams in the upper and lower lacustrine layers are discontinuous and that the focus of the CMS will be on the unconsolidated unit overlying the upper lacustrine layer. Given the depth and frequency of contaminant occurrence, it may be appropriate to focus the CMS on the unconsolidated unit. As was indicated in U.S. EPA's January 5, 1994 letter, the issue regarding whether sand seams in the lower lacustrine layer are discontinuous should be deferred. It is also well documented in the Final RFI report that migration pathways to the lake exist, and that the upper lacustrine layer, the unconsolidated unit, and the groundwater beneath the facility are contaminated with metals, volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs). In addition to the migration pathways and contaminants, adjacent lake sediments are also contaminated. As long as these contaminated media and all migration pathways to the Lake are addressed in the CMS, the issue of discontinuous sand seams in any of the geologic units beneath the CWMCS facility will become moot.

Response: Based upon all data collected and evaluated, which includes the results of both in-situ and laboratory permeability tests, isotope date aging of methane encountered during drilling, and consultation with Ardith Handzel of the ISGS, we conclude to a reasonable degree of scientific certainty that the sand seams in the upper and lower lacustrine layer are discontinuous. In accordance with the Agency's May 3, 1995 determination, we concur that the focus of the CMS should be on the unconsolidated unit (fill) overlying the lacustrine layer.

USEPA Comment: Risk Assessment Issue

In your response, you indicate that CWMCS submitted a Human Health Risk Assessment (HHRA) as an appendix to the RFI report and that in lieu of commenting on the HHRA report, U.S. EPA directed its consultant to prepare a supplemental HHRA (SHHRA). You further state that U.S. EPA demanded that the SHHRA information be incorporated without correction into the RFI report and that, to this date, U.S. EPA failed to identify the serious shortcoming, when in fact it has. CWMCS also states that it recommends that the SHHRA be withdrawn because U.S. EPA assumed in the SHHRA that commonly employed personal protective equipment (PPE) would not be employed at the facility.

Your description of the chronology of events regarding the risk assessment issue is inaccurate and unresponsive to the actual record of events, which includes your response to U.S. EPA's comments on CWMCS base line Risk Assessment (RA). In U.S. EPA's March 1, 1991 letter to CWMCS, item 4 specifically requested that CWMCS conduct a full-fledged risk and environmental assessment that is consistent with Task III.D of the Scopes of Work, Attachment

A of the C.J. The CWMCS RA report was submitted to U.S. EPA on December 6, 1993. CWMCS also requested that this RA report be considered as draft because CWMCS has identified several inconsistencies in its own report and data.

Prior to the U.S. EPA's June 3, 1994 letter and comments on CWMCS RA report, and based on reviews of the hard-copy and digitized CWMCS's RA data, U.S. EPA identified two potential receptors (i.e. remediation onsite workers and subsistence fishermen) that were not evaluated in the CWMCS RA. U.S. EPA had previously notified CWMCS of these deficiencies during a December 29, 1993 telephone conversation. During that conversation, CWMCS indicated that these potential receptors were not necessary and should not be included in the RA. U.S. EPA disagreed with CWMCS's position on this issue. CWMCS was then informed that U.S. EPA will be evaluating the risk to these two potential receptors and the results would be incorporated in the RA.

Consistent with U.S. EPA's policy regarding conducting full-fledged risk assessments, U.S. EPA supplemented the CWMCS risk data in the RA report, after CWMCS declined to evaluate risks to the above-mentioned two potential receptors. U.S. EPA prepared an additional risk assessment to compensate for the deficient and incomplete RA. Based on the findings of the SHHRA, construction and utility workers are assumed to be exposed to a significant carcinogenic risk (in excess of 10^{-4}) in the eastern fenced area of the facility that includes the former biobed area; and remediation workers can be assumed to employ PPE because their work must be performed in accordance with a health and safety plan (HSP). However, it is not commonly assumed that typical construction and utility workers wear PPE for routine underground construction or repair activities. Therefore, the SHHRA must remain an integral part of the HHRA and the final RFI report.

Finally, your August 19, 1994 response to U.S. EPA's June 3, 1994 comments on the CWMCS RA report clearly indicate that U.S. EPA prepare the SHHRA only after furnishing comment son the CWMCS HHRA. Attachment II of the August response refers to U.S. EPA's comments on these two potential receptors that were not evaluated in the CWMCS baseline HHRA.

Response: The Final Risk Assessment was submitted to USEPA as part of the Final RFI Report. This included a summary of cancer risks for affected workers. This risk document attempted to avoid absolute conclusions and relied upon USEPA standards to determine levels of risk. The calculated levels are within ranges considered acceptable by USEPA for industrial settings. The Agency concluded in their SHHRA that these workers would not use personal protective equipment in violation of OSHA standards that would result in an unacceptable cancer risk. This assumption is fundamental to the conclusions developed in the Agency's SHHRA. Because of this incorrect assumption, the recommendation stands that the SHHRA is flawed and should be withdrawn.

USEPA Comment: Surface Water and Sediment Impact Issue

CWMCS states that very little contamination was found in surface water and that no significant risk may exist from exposure to sediment under the exposure scenarios considered in the SHHRA. CWMCS further states that surface water and sediment are outside of the scope of the CMS. U.S. EPA has re-evaluated the CWMCS's Final RFI report and your response to the preliminary determination. We agree with the general concept of focusing the CMS on contaminated soils and groundwater within the pier. However, this idea does not preclude the need to remediate contaminated sediments, which likely resulted from hazardous waste management activities at the CWMCS facility. As was indicated in the table (Attachment II) of January 5, 1994 comment letter, Polycyclic Aromatic Hydrocarbons (PAHs) in sediments of sampling location S-1 identified in the Final RFI report (Table 4-36) exceed the benchmarks for individual and total PAHs as established in the "Guidance for Protection and Management of Aquatic Sediment Quality in Ontario" and "National Oceanic & Atmospheric Administration" and U.S. EPA Sediment Quality Criteria. Your explanation of the ubiquitous nature of PAHs are reasonable when applied to the entire Lake Calumet region. However, contaminated sediments, in close proximity to the facility, most likely resulted from waste management areas within the facility. The CMS portion addressing surface water and sediments should focus on remediating only those contaminated sediments that have been identified during the RFI. In addition, the following items below support U.S. EPA's position that these sediments and the Lake waters must be protected from further degradation:

- Multitude of contaminants detected in the groundwater continues to discharge to the Lake based on the facility's hydrogeologic conditions;

- Two major dissolved groundwater plumes exist for various volatile organic compounds (VOCs). The dissolved VOC plumes such as benzene, 1,1-dichloroethene, phenol, 2,4-dichlorophenol and semi-VOC naphthalene slowly discharge to the lake and degrade the lake water quality long term and degrade the sediment quality short term;

- Though diluted in the lake water U.S. EPA's and CWMCS's flux calculations show that contaminants discharge to the lake, thus degrading lake water quality and;

- The integrity of the onsite vault liner as a barrier preventing migration of leachate from the vault to the lake or infiltration of groundwater into the vault is questionable.

Response: CWMCS provided accurate data on surface water and sediment constituents during both phases of the RFI. The UESPA agreed that contaminants are essentially not detectable in surface water because of infinite dilution. Additionally, the USEPA's risk assessor concluded that there may be no significant carcinogenic risk from exposure to

sediments under the scenarios considered. Despite these conditions, USEPA contends that contaminants in the fill leach into the lake via the groundwater pathway and degrade surface water and sediment quality despite dilution. The USEPA's conclusion has no basis in fact.

Similarly, CWMCS provided substantial data and analysis on the vault leachate and groundwater quality in the area of the vault. In addition, low permeability conditions, especially in the vault itself, indicate that the quantity of radial flow from mounded groundwater areas on the pier is insignificant. It was also shown that the groundwater quality in the vault area is comparable to groundwater quality in other areas of the pier. Consequently, there is no reason to believe that leakage from the vault is occurring that may impact lake water quality, or conversely, that groundwater leakage into the vault occurs.

USEPA Comment: Vault, G-349 and Other Areas

CWMCS states that the CMS should address the entire facility using a single or multiple options.

U.S. EPA agrees that a single or multiple remediation alternatives may be appropriate for the entire facility as long as all contaminated areas and media are adequately addressed. Soil and groundwater contamination should be addressed for all solid waste management units investigated during the RFI, including but not limited to the vault, monitoring well G-349, former biobeds, and the Hyon tank farm area.

In summary, based on the results presented in the final RFI report, EPA's evaluation of that report, and the foregoing discussion, the scope of the CMS should address contaminated soils and groundwater in the unconsolidated unit overlying the upper lacustrine layer. As shown in Part 1, Sections 4.2 and 4.3, and Part 3 of the final RFI report, soil and groundwater contamination in this unit exceeds both background levels and applicable regulatory levels for protection of Class II groundwater in the State of Illinois. In addition, as shown in Part 1, Section 4.2, and as determined by EPA's evaluation of the final RFI data, groundwater in the unconsolidated unit is hydraulically connected to and discharges a multitude of contaminants to Lake Calumet. Therefore, soil and groundwater, including contaminated sediments, remediation should be addressed in the CMS for all relevant areas. Institutional controls restricting underground construction and utility work as discussed above should be an integral part of correction measures for the facility.

Response: CWMCS agreed with the Agency that the entire facility should be addressed using either a single or multiple analysis of remedial options. All SWMUs as well as the area of the vault and G-349 will be included in the evaluation of options since these areas are part of the affected facility. However, as discussed in the previous response, there is no factual basis to include the remediation of surface water or sediments in Lake Calumet in this evaluation. There is no impact on surface water as demonstrated by the data. Similarly, measured impacts on sediments in the area of the facility are no different from more distant

areas in Lake Calumet. Consequently, including sediments and surface water as part of the remedial analysis would result in unnecessary costs on media not affected by the subject property.

Appendix D
Application for Groundwater Management Zone

CleanHarbors
ENVIRONMENTAL SERVICES, INC.
325 WOOD ROAD, PO BOX 327 • BRAINTREE, MA 02184-2402
(617) 849-1800

RECEIVED
NOV 30 1995

WRITER'S DIRECT NUMBER
Extension 4182

LAW DEPARTMENT
(617) 849-1800
FAX (617) 356-1375

VIA OVERNIGHT DELIVERY

November 29, 1995

Dames & Moore, Inc.
Attn: David P. Trainor, Managing Principal
2701 International Lane, Suite 210
Madison, Wisconsin 53704

Re: Clean Harbors of Chicago, Inc.
Corrective Action at Former CWM Site

Dear David:

Enclosed please find the original executed Application for Groundwater Management Zone for inclusion in the Initial CMP Report.

Very truly yours,

Jules B. Selden
Corporate Attorney

Enclosure

Part I. Facility Information

Facility Name Clean Harbors of Chicago, Inc. (Former CWMCS Chicago Incinerator Facility)

Facility Address 11700 South Stony Island Avenue, Chicago, Illinois

County Cook

Standard Industrial Code (SIC) 4953

1. **Provide a general description of the type of industry, products manufactured, raw materials used, location and size of the facility.**

Facility is approximately 22 acres in size, and has been used for the storage, treatment, and disposal of hazardous wastes since the early 1970s. Waste disposal has included incineration, biochemical filtration, and wastewater treatment of process water.

2. **What specific units (operating or closed) are present at the facility which are or were used to manage waste, hazardous waste, hazardous substances or petroleum?**

	YES	NO
Landfill	X	
Surface Impoundment	X	
Land Treatment		X
Spray Irrigation		X
Waste Pile		X
Incinerator	X	
Storage Tank (above ground)	X	
Storage Tank (underground)	X	
Container Storage Area	X	
Injection Well		X
Water Treatment Units	X	
Septic Tanks		X
French Drains		X
Transfer Station		X
Other Units (Please describe)		

3. **Provide an extract from a USGS topographic or county map showing the location of the site and a more detailed scaled map of the facility with each waste management unit identified in Question 2 or known/suspected source clearly identified. Map scale must be specified and the location of the facility must be provided with respect to Township, Range and Section.**

The site is located in Section 24, Township 37 North, Range 14 East. Site location is shown on Figure 1-1 of Initial Corrective Measures program Report.

4. **Has the facility ever conducted operations which involved the generation, manufacture, processing, transportation, treatment, storage or handling of "hazardous substances" as defined by the Illinois Environmental Protection Act? Yes_X_ No __ If the answer to this question is "yes" generally describe these operations.**

Waste management practices have included incineration, biochemical filtration, and wastewater treatment of process water.

5. **Has the facility generated, stored or treated hazardous waste as defined by the Resource Conservation and Recovery Act? Yes_X_ No __ If the answer to this question is "yes" generally describe these operations.**

Hazardous waste material was stored at the facility prior to incineration. Hazardous material generated at the facility was disposed at a hazardous waste landfill.

6. **Has the facility conducted operations which involved the processing, storage or handling of petroleum? Yes_X_ No __ If the answer to this questions is "yes" describe these operations.**

Fuel oil stored on property in both aboveground and underground storage tanks.

7. **Has the facility ever held any of the following permits?**

a. **Permits for any waste storage, waste treatment or waste disposal operation. Yes_X**

No __ If the answer to this question is "yes", identify the IEPA permit numbers.

Under the CWMCS Chicago Incinerator Facility, the following IEPA permits were issued:
1) IEPA Division of Land Pollution Control Operating Permit #1981-046-OP (revised 4/11/84), no expiration.
2) IEPA Division of Land Pollution Control ID #0316000058, reissued 8/01/84, no expiration.
3) IEPA Division of Air Pollution Control Permit, issued 6/24/91 expires 11/21/91 ID #031600AGZ.

b. **Interim Status under the Resources Conservation and Recovery Act (filing of a RCRA Part A application). Yes __ No_X_ If the answer to this questions is "yes", attach a copy of the last approved Part A application.**

c. **RCRA Part B Permits. Yes_X_ No __ If the answer to this questions is "yes", identify the permit log number.**

IEPA #0316000051, USEPA ILD #000608471
RCRA Log No. B-16-M-2, B-16, M-4

8. Has the facility every conducted the closure of a RCRA hazardous waste management unit? Yes_X_ No __

Four interim surface impoundments were certified closed by the IEPA on June 30, 1994. The surface impoundments remain active land disposal units operating under Post-Closure care.

9. **Have any of the following State or federal government actions taken place for a release at the facility?**

a. **Written notification regarding known, suspected or alleged contamination on or emanating from the property (e.g., a Notice pursuant to Section 4(q) of the Environmental Protection Act)? Yes __ No_X_ If the answer to this question is "yes", identify the caption and date of issuance.**

b. **Consent Decree or Order under RCRA, CERCLA, EPAct Section 22.2 (State Superfund), or EPAct Section 21(f) (State RCRA). Yes_X_ No __**

RCRA Corrective Action Plan ILD 000672121.

c. **If either of Items a or b were answered by checking "yes", is the notice, order or decree still in effect? Yes __ No_X_**

10. **What groundwater classification will the facility be subject to at the completion of the remediation?** Class I __ Class II X Class III __ Class IV __ **If more than one Class applies, please explain.**

11. **Describe the circumstances which the release to groundwater was identified.**

Groundwater contamination in the vicinity of each SWMU was identified during Phase I and II of a RCRA Facility Investigation.

Based on my inquiry of those persons directly responsible for gathering the information, I certify that the information submitted is, to the best of my knowledge and belief, true and accurate.

Facility Name Clean Harbors of Chicago, Inc. (Former CWMCS Chicago Incinerator Facility)

Location of Facility 11700 South Stony Island Avenue, Chicago, Illinois

EPA Identification Number USEPA ILD #000608471

Signature of Owner/Operator Jules B. Selden

Name of Owner/Operator CLEAN HARBORS OF CHICAGO, INC.
BY: JULES B. SELDEN, CORPORATE ATTORNEY

Date Nov. 29, 1995

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PART II: Release Information

1. **Identify the chemical constituents released to the groundwater. Attach additional documents as necessary.**

Chemical Description

See section 2.0 and 3.0 of the Initial Corrective Measures Program Report dated December 4, 1995.

Chemical Abstract No.

See Table 6-3 of Phase I Supplemental RFI Work Plan dated December 4, 1995.

2. **Describe how the site will be investigated to determine the source or sources of the release.**

Corrective Measures Program will be implemented in accordance with Attachment K of RCRA Modified Part B Permit (IEPA #0316000051).

3. **Describe how groundwater will be monitored to determine the rate and extent of the release.**

Corrective Measures Program will be implemented in accordance with Attachment K of RCRA Modified Part B Permit (IEPA #0316000051).

4. **Has the release been contained onsite at the facility?**

The facility is surrounded by surface water. Surface water samples were collected from Lake Calumet. No discernable plumes were identified during the RFI.

5. **Describe the groundwater monitoring network and groundwater and soil sampling protocols in place at the facility.**

Two rounds of groundwater samples were collected during Phase I (1989) and Phase II (1991) of the RFI. Compliance Post-Closure groundwater monitoring is being conducted quarterly at four (4) upgradient and five (5) downgradient monitoring well locations.

6. **Provide the schedule for investigation and monitoring.**

Corrective Measures Program will be implemented in accordance with Attachment K of RCRA Modified Part B Permit (IEPA #0316000051).

7. **Describe the laboratory quality assurance program utilized for the investigation.**

Corrective Measures Program will be implemented in accordance with Attachment K of RCRA Modified Part B Permit (IEPA #0316000051).

8. **Provide a summary of the results of available soil testing and groundwater monitoring associated with the release at the facility. The summary of results should provide the following information: dates of sampling; types of samples taken (soil or water); locations and depths of samples; sampling and analytical methods; analytical laboratories used; chemical constituents for which analyses were performed; analytical detection limits; and concentrations of chemical constituents in ppm (levels below detection should be identified as "ND").**

See Tables 2-2, 2-3, 2-8, 2-11, 2-18, and 2-19 included in the Initial Corrective Measures Program Report dated December 4, 1995.

Based on my inquiry of those persons directly responsible for gathering information, I certify that the information submitted is, to the best of my knowledge and belief, true and accurate and confirm that the actions identified herein will be undertaken in accordance with the schedule set forth herein.

Facility Name: Clean Harbors of Chicago, Inc. (Former CWMCS Chicago Incinerator Facility)

Location of Facility: 11700 South Stony Island Drive

EPA Identification Number: USEPA ILD # 000608471

Signature of Owner/Operator: Jules B. Selden

Name of Owner/Operator: CLEAN HARBORS OF CHICAGO, INC.
BY: JULES B. SELDEN, CORPORATE ATTORNEY

Date: NOV. 29, 1995

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